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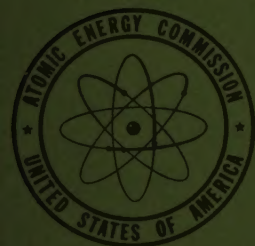
# Nuclear Science Abstracts

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## NUCLEAR SCIENCE ABSTRACTS

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Each issue of volume 7(1953) contains an author index to abstracts in that issue and a supplement to the Numerical Index of Reports. Subject and author indexes, as well as a cumulation of the Numerical Index of Reports, covering three-month periods are issued as supplements to the sixth, twelfth, and eighteenth issues. The 24th issue will be the annual index for the year, superseding the three index supplements mentioned above.

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# NUMERICAL INDEX OF REPORTS

Numerical Index of Official Atomic Energy Reports with Indications of Their Availability

This quarterly cumulation supplements the Numerical Index of Reports with Indications of Their Availability which appears in NSA, Volume 6, No. 24A. No further reference to the lists appearing in Vol. 7 Nos. 1 thru 6A is necessary. As reports are in manuscript form when abstracted for NSA, there may be some delay before the reports will be available at the Depository Libraries. The notation NSA in the Availability column indicates the appearance of a report in its

entirety in NSA. In general, this list refers only to those reports abstracted in issues preceding the current one. Orders for items for which prices are indicated should be directed to:

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NSA - NUCLEAR SCIENCE ABSTRACTS  
ADD - ABSTRACTS OF DECLASSIFIED DOCUMENTS  
the predecessor of NSA  
NNES - National Nuclear Energy Series, published by the McGraw-Hill Book Company

Code designations are assigned as follows:

MDDC - To declassified reports released by the Manhattan Engineer District and by the Atomic Energy Commission before March 1, 1948

AECD - To declassified reports released by the Atomic Energy Commission after February 29, 1948 (appeared in April 15, Nuclear Science Abstracts)

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Other code designations below are assigned to unclassified reports by the originating installations

Report	Abstract	Availability	Report	Abstract	Availability
<b>AECD</b>	<b>NSA</b>		<b>AECU</b>	<b>NSA</b>	
2994	5-647	J. Optical Soc. Am. 42, 408-15(1952)	1904	6-2320	J. Phys. Chem. 56, 885(1952)
3243	5-6146	Phys. Rev. 88, 465-6(1952)	1905	6-2431	Rev. Sci. Instruments 23, 502-3(1952)
3246	5-6307	Rev. Sci. Instruments 23, 595-8(1952)	1906	6-2324	Phys. Rev. 87, 439(1952)
3290	6-893	Part in J. Applied Phys. 23, 1263-6(1952)	1907	6-2432	Rev. Sci. Instruments 23, 503-4(1952)
3328	6-2644	Anal. Chem. 24, 1780(1952)	1929	6-2581	Arch. Biochem. and Biophys. 41, 42-7(1952)
3333	6-2604	Anal. Chem. 25, 116-19(1953)	1931	6-2712	Rev. Sci. Instruments 23, 643-4(1952)
3345	6-2934	J. Metals (N.Y.) 5, 344-8(1953)	1933	6-2737	Revs. Modern Phys. 24, 120-32(1952)
3353	6-3216	J. Am. Chem. Soc. 74, 6040-7(1952)	1970	6-3531	Discussions Faraday Soc., No. 12, 88-98(1952)
3360	6-3241	J. Chem. Phys. 21, 70-2(1953)	1983	6-3533	Discussions Faraday Soc., No. 12, 33-44(1952)
3362	6-3258	J. Chem. Phys. 21, 42-5(1953)	1984	6-3214	J. Am. Chem. Soc. 74, 6007-12(1952)
3373	6-3814	\$0.35	1995	6-3332	Rev. Sci. Instruments 23, 571-2(1952)
3378	6-3811	J. Am. Chem. Soc. 74, 6081-4(1952)	1997	6-3348	J. Am. Soc. Naval Engrs. 64, 611-19(1952)
3414	6-4981	Phys. Rev. 89, 502-7(1953)	1998	6-3215	J. Am. Chem. Soc. 74, 4174(1952)
3420	6-5228	Phys. Rev. 88, 828-31(1952)	2016	6-3525	Acta Cryst. 5, 683(1952)
3428	6-5470	Phys. Rev. 88, 823-4(1952)	2018	6-3738	Arch. Biochem. and Biophys. 41, 212-32(1952)
3430	6-5364	Nucleonics 11, No. 1, 16-21(1953)	2019	6-3671	Phys. Rev. 87, 785-6(1952)
3432	6-5710	J. Am. Chem. Soc. 74, 6065-6(1952)	2042	6-3958	J. Applied Phys. 23, 1257-61(1952)
3436	6-5863	Phys. Rev. 89, 320(1953)	2043	6-4197	Phys. Rev. 87, 915-21(1952)
3442	6-5813	J. Soc. Motion Picture Television Engrs. 59, 369-78(1952)	2053	6-4252	Phys. Rev. 87, 528-9(1952)
3446	6-5934	\$0.80	2056	6-3893	J. Lab. Clin. Med. 40, 342-54(1952)
3458	7-324	Phys. Rev. 88, 1429-31(1952)	2075	6-4524	J. Am. Chem. Soc. 74, 5530(1952)
3462	7-298	NSA; Phys. Rev. 89, 318(1953)	2077	6-4389	Revs. Modern Phys. 24, 74-8(1952)
<b>AECU</b>			2078	6-4448	J. Am. Chem. Soc. 74, 5531(1952)
1207	5-2985	Biol. Progress 2, 1-52(1952)	2087	6-4342	Arch. Biochem. and Biophys. 41, 367-77(1952)
1360	5-5303	Rev. Sci. Instruments 23, 350-6(1952)	2104	6-4941	Phys. Rev. 88, 418(1952)
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1839	6-1730	Welding J. Research Supplement, 1-4(1952)	2148	6-5285	Phytopathology 42, 599-602(1952)
1844	6-1427	J. Chem. Phys. 20, 746-7(1952)	2153	6-5286	New Engl. J. Med. 247, 663-7(1952)
1847	6-1659	J. Am. Chem. Soc. 74, 6161-7(1952)	2154	6-5342	J. Am. Chem. Soc. 74, 6213-16(1952)
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1866	6-1608	Cancer Research 12, 787-92(1952)	2175	6-5581	J. Chem. Phys. 20, 1654-5(1952)
1868	6-1677	Discussions Faraday Soc., No. 12, 169-88(1952)	2185	6-5559	J. Biol. Chem. 199, 75-84(1952)
1878	6-2125	Rev. Sci. Instruments 23, 604-6(1952)	2191	6-5585	J. Biol. Chem. 199, 573-7(1952)
1883	6-2168	Phys. Rev. 88, 1309-11(1952)			

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<b>AECU</b>			<b>ISC</b>		
2202	6-5714	Science 116, 603(1952)	237	6-5367	\$0.55
2206	6-5925	Cancer Research 12, 909-11(1952)	249	6-5380	Phys. Rev. 88, 1092-8(1952)
2216	6-6013	Arch. Biochem. and Biophys. 41, 1-8(1952)	<b>K</b>		
2217	6-6477	Nucleonics 10, No. 12, 54-7(1952)	768	5-5148	J. Am. Chem. Soc. 74, 5749-51(1952)
2229	6-6343	Proc. Soc. Exptl. Biol. Med. 81, 416-17(1952)	788	5-7040	J. Phys. Chem. 56, 1010(1952)
2234	6-6565	J. Am. Chem. Soc. 74, 5548(1952)	941	6-5807	Acta Cryst. 6, 55-6(1953)
2235	6-6474	Phys. Rev. 88, 417-18(1952)	<b>LAMS</b>		
2237	6-6439	Phys. Rev. 88, 414-15(1952)	1396	6-5469	Nucleonics 11, No. 1, 67-9(1953)
2239	6-6371	Phys. Rev. 88, 1172-6(1952)	<b>ML</b>		
2240	6-6372	Phys. Rev. 88, 1182-6(1952)	165	6-6132	Phys. Rev. 88, 1053-64(1952)
2256	6-6570	J. Am. Chem. Soc. 74, 6154-5(1952)	<b>MLM</b>		
2265	6-6495	Nucleonics 11, No. 1, 9-11(1953)	639	6-1432	Anal. Chem. 24, 1678(1952)
2277	7-344	\$0.20	<b>MTA</b>		
2289	7-591	J. Chem. Phys. 20, 1974-5(1952)	2	7-889	NSA
2328	7-734	NSA	<b>NAA-SR</b>		
<b>AERE-C/R</b>			159	6-1152	J. Applied Phys. 23, 1194-1200(1952)
801	6-2860	J. Chem. Soc., 4315-30(1952)	167	6-4430	J. Applied Phys. 23, 1200-6(1952)
<b>AERE-T/R</b>			185	6-4681	Nucleonics 11, No. 1, 42-3(1953)
963	7-300	Proc. Roy. Soc. (London) 215, 398-403(1952)	<b>NM</b>		
983	7-345	Proc. Roy. Soc. (London) 215, 497-507(1952)	001-059.13.03	7-603	J. Aviation Med. 25, 334-44, 401(1952)
<b>ANL</b>			<b>NP</b>		
4645	5-5089	J. Chem. Phys. 20, 1438-42(1952)	3601	6-1451	Nucleonics 10, No. 12, 58-61(1952)
4723	6-1415	J. Chem. Phys. 20, 1443-7(1952)	3643	6-2342	J. Am. Chem. Soc. 74, 3489-92(1952)
4782	6-4035	J. Am. Chem. Soc. 74, 4679(1952)	3720	6-3220	Phys. Chem. 56, 858(1952)
4783	6-4034	J. Am. Chem. Soc. 74, 4682(1952)	3951	6-5351	J. Am. Chem. Soc. 74, 6074-6(1952)
4813	6-4572	J. Am. Chem. Soc. 74, 6091-6(1952)	3769	6-3419	Phys. Rev. 89, 490-501(1953)
4865	6-6710	Phys. Rev. 89, 302-9(1953)	4113	7-269	Phys. Rev. 88, 998-1002(1952)
<b>BMI</b>			4123	7-301	Phys. Rev. 86, 73-81(1952)
788	7-1120	\$0.20	<b>NRL</b>		
<b>BNL</b>			4013	6-5641	Nucleonics 11, No. 1, 22-7(1953)
186	6-5750	Nucleonics 10, No. 12, 72-3(1952)	<b>NYO</b>		
1051	6-1928	Ann. N. Y. Acad. Sci. 55, 904-14(1952)	530	6-3042	Phys. Rev. 82, 796-807(1951)
1080	6-1678	Discussions Faraday Soc., No. 12, 79-87(1952)	736	5-6654	J. Am. Chem. Soc. 74, 1383-5(1952)
1097	6-2294	J. Phys. Chem. 56, 846-52(1952)	766	6-3857	Rev. Sci. Instruments 23, 519-22(1952)
1157	6-5185	Revs. Modern Phys. 24, 179-239(1952)	846	6-807	J. Am. Chem. Soc. 74, 6109-12(1952)
1177	6-4637	Rev. Sci. Instruments 23, 629-34(1952)	847	6-3232	J. Am. Chem. Soc. 74, 6112-13(1952)
1190	6-5010	Am. J. Physiol. 171, 17-21(1952)	851	6-1640	J. Am. Chem. Soc. 74, 6112-13(1952)
1199	6-5247	Acta Cryst. 5, 768-70(1952)	3091	7-1150	\$0.25
1201	6-5292	Proc. Soc. Exptl. Biol. Med. 80, 741(1952)	3107	7-586	0.35
1210	6-5503	Phys. Rev. 88, 851-9(1952)	3187	6-5316	Anal. Chem. 25, 192-4(1953)
1211	6-5378	J. Applied Phys. 23, 1379-82(1952)	3217	6-5895	Phys. Rev. 88, 1099-1109(1952)
1213	6-5356	J. Am. Chem. Soc. 74, 6144(1952)	3218	6-5686	Phys. Rev. 88, 1206-7(1952)
1218	6-6176	Phys. Rev. 88, 1190-6(1952)	3226	7-303	Phys. Rev. 89, 349-52(1953)
1219	6-6177	Phys. Rev. 88, 1197-9(1952)	3228	6-6720	\$0.70
1230	6-5937	Nucleonics 10, No. 11, 88-9(1952)	3374	6-4744	J. Am. Chem. Soc. 74, 6103-4(1952)
1231	6-6149	Phys. Rev. 88, 1257-61(1952)	3377	6-6580	J. Am. Chem. Soc. 74, 5217(1952)
1232	6-5938	Proc. Soc. Exptl. Biol. Med. 81, 348-50(1952)	3407	6-6203	J. Optical Soc. Am. 42, 706-12(1952)
1243	6-6411	Phys. Rev. 88, 958-9(1952)	3505	6-6557	\$0.25
1246	6-6189	Phys. Rev. 88, 1186-90(1952)	3610	6-4412	Anal. Chem. 24, 1931-3(1952)
1249	6-6362	Phys. Rev. 89, 185-8(1953)	3662	7-660	Phys. Rev. 88, 954(1952)
1253	6-6465	Phys. Rev. 88, 1312-21(1952)	3663	7-692	NSA
1261	7-680	Phys. Rev. 89, 204-22(1953)	3700	7-304	Phys. Rev. 89, 396-8(1953)
1263	6-6693	Phys. Rev. 88, 954-5(1952)	3702	6-6427	Phys. Rev. 88, 956-7(1952)
1271	7-668	Nucleonics 11, No. 1, 66(1953)	3703	7-270	Phys. Rev. 88, 1211-12(1952)
1274	7-671	J. Chem. Phys. 21, 182(1953)	3705	7-349	Phys. Rev. 88, 1208-9(1952)
1294	7-998	Phys. Rev. 89, 323-4(1953)	3837	7-228	Phys. Rev. 88, 683-4(1952)
<b>CU</b>			3901(p.3-12)	7-388	Phys. Rev. 89, 182-5(1953)
99	7-672	NSA	3901(p.13-24)	7-389	Phys. Rev. 88, 1065-9(1952)
103	6-5703	Phys. Rev. 87, 391-2(1952)	4025	6-6293	Pediatrics 10, 667-75(1952)
<b>ISC</b>					
174	7-242	\$0.55			
212	6-3073	J. Phys. Chem. 56, 1097-1101(1952)			

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ORNL			UCRL		
842	6-1163	<u>Anal. Chem.</u> 24, 1895-9(1952)	1657	6-2328	<u>Discussions Faraday Soc.</u> No. 12, 155-61 (1952)
1303	7-761	\$0.20	1673	6-2506	<u>Phys. Rev.</u> 89, 78-9(1953)
1370	6-6589	0.35	1792	6-4947	<u>Phys. Rev.</u> 88, 901-5(1952)
1376	7-124	0.30	1846	6-4760	<u>J. Am. Chem. Soc.</u> 74, 6272-3(1952)
1406	7-1174	\$0.20	1864	7-66	\$0.25
SO			1881	6-5457	<u>Phys. Rev.</u> 88, 750-1(1952)
2023	6-6613	<u>J. Applied Phys.</u> 23, 1409-10(1952)	1914	6-5451	<u>Phys. Rev.</u> 89, 1-3(1953)
TID			1929	7-620	\$0.25
369	6-3957	\$3.10	1931	7-108	0.10
3032	7-1539	0.25	1932	7-678	0.20
3066(1st rev.)	6-5960	0.45	1940	7-272	<u>Phys. Rev.</u> 88, 1426-7(1952)
UCLA			1941	6-6841	<u>Acta Cryst.</u> 6, 106(1953)
165	6-36	<u>J. Cellular Comp. Physiol.</u> 40, 115-25 (1952)	1947	7-173	\$0.25
190	8-2805	<u>J. Am. Pharm. Assoc., Sci. Ed.</u> 41, 510-11 (1952)	1951	7-340	0.35
194	6-3344	<u>Nucleonics</u> 10, No. 12, 65-7(1952)	1957	7-524	0.20
204	6-4343	<u>J. Am. Pharm. Assoc., Sci. Ed.</u> 41, 559-61 (1952)	1963	7-273	<u>Phys. Rev.</u> 88, 1427(1952)
219	6-5834	<u>Nucleonics</u> 10, No. 12, 74(1952)	1967	7-977	\$0.35
UCRL			1999	7-845	0.20
1564	6-831	<u>J. Phys. Chem.</u> 56, 901(1952)	UR		
1565	6-832	<u>J. Phys. Chem.</u> 56, 897(1952)	211	6-5011	<u>Science</u> 116, 706-8(1952)
1568	6-850	<u>J. Am. Chem. Soc.</u> 74, 5975-9(1952)	223	7-763	<u>J. Biol. Chem.</u> 199, 199-205(1952)
1593	6-1004	<u>Phys. Rev.</u> 89, 508-17(1953)	USNRDL		
			341	6-3500	<u>Am. J. Physiol.</u> 170, 724-30(1952)
			343	6-5403	<u>Am. Ind. Hyg. Assoc. Quart.</u> 13, 226-31 (1952)
			350	6-4372	<u>Am. J. Physiol.</u> 171, 349-53(1952)
			352	6-5278	<u>Nucleonics</u> 11, No. 1, 56-61(1953)
			358	6-5951	<u>Nucleonics</u> 11, No. 1, 56-61(1953)



# NEW NUCLEAR DATA

Summary of New Nuclear Data on Half Lives, Radiations, Relative Isotopic Abundances, Nuclear Moments, Neutron Cross Sections, Reaction Energies, and Masses.

Prepared by National Bureau of Standards Nuclear Data Group with assistance of Readers.

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The material cumulated here is that which has appeared in NSA Vol. 7, Nos. 1 through 6A.

## ABBREVIATIONS

a	absorption measurement	EA	electrostatic analyzer
$a\beta\gamma$	absorption of $\beta$ 's in coincidence with $\gamma$ 's	E1,E2,...	electric dipole, electric quadrupole
ace <sup>-</sup>	absorption of conversion electrons	$\epsilon$	electron capture
a coin	measurement by placing absorbers between counters in coincidence	$\epsilon_K, \epsilon_L$	electron capture from K, L shell
$\alpha$	total $\gamma$ -ray conversion coefficient, $N_\alpha/N_\gamma$	f	fission, in abbreviations for methods of production or detection
$\alpha_K, \alpha_L, \dots$	$\gamma$ -ray conversion coefficient for electrons ejected from the K, L, ... shell	F-K	Fermi-Kurie $\beta$ energy distribution plot
b	coefficient in angular correlation function, $1 + b \cos^2 \theta$	$\gamma(\theta, T)$	numbers of $\gamma$ 's as function of angle and temperature
B	band spectra method	$\Gamma$	resonance half-width (the whole width at half-maximum)
Be $\gamma$ n	measurement by detection of photoneutrons from Be	g.s.	ground state
$\beta\gamma, \gamma\gamma$	$\beta\gamma$ or $\gamma\gamma$ coincidences	I	(1) spin in units of $\hbar/2\pi$ ; (2) nuclear induction magnetic resonance method
$\beta\gamma(\theta)$	angular correlation of $\beta$ 's and $\gamma$ 's in coincidence	ic	ionization chamber
Calc	calculated value from experimental work reported elsewhere	J	quantum state of compound nucleus in a nuclear reaction. "I" is used to denote the spin of the target nucleus, final nucleus
cc	cloud chamber	K/L	$\alpha_K/\alpha_L$
ce <sup>-</sup>	conversion electrons	l	angular momentum of particle absorbed into nucleus
chem	chemical separation of product following reaction	M	molecular or atomic beam resonance method
Cpt	Compton electrons	M1,M2,...	magnetic dipole, magnetic quadrupole...
d	(1) deuteron, (2) descendant of, (3) days, when used as superscript	mb	millibarns
d,p( $\theta$ )	angular distribution of protons with respect to deuteron beam	Mic	microwave method
D $\gamma$ n,D $\gamma$ p	measurement by detection of photoneutrons or photoprotons from deuterium	mir	measurement by total reflection of neutron beam from mirror surface
$\bar{E}$	average energy	ms	mass spectrometer
$E_\theta$	resonance energy	$\mu$	(1) magnetic moment in units of nuclear magnetons, (2) micron, $10^{-4}$ cm
$E_\beta, E_\gamma, \dots$	energy of $\beta$ ray, energy of $\gamma$ ray, ...	$\mu s$	microseconds
$E_{dis}$	disintegration energy		

osc	pile oscillator method	$\sigma_0$	cross section at resonance energy, $E_0$
p	(1) proton, (2) predecessor of	$\sigma_a$	absorption cross section
para	paramagnetic resonance method	$\sigma_{el}$	elastic scattering cross section
pc	proportional counter	$\sigma_{in}$	inelastic scattering cross section
pe <sup>-</sup>	photo electrons	$\sigma_s$	scattering cross section
ppl	photoplates or emulsions	$\sigma_t$	total cross section
q	electric quadrupole moment in units of barns	t	triton, $H^3$
Q	reaction energy in Mev	$\tau$	half life in units indicated
s	(1) spectrometer method, (2) seconds, when used as superscript	$\tau_1, \tau_2$	half life of upper, lower state
S	atomic-spectra measurement	th	thermal
scin	scintillation counter	w, vw	weak, very weak
sl	lens spectrometer	(0.123)	$\beta$ and $\gamma$ energy values enclosed in parentheses are given for identification purposes
sl;ce <sup>-</sup>	conversion electrons measured in lens spectrometer	%	% of disintegrations
st	strong	†	relative numbers. When used in connection with $\gamma$ rays, relative numbers of photons, not photons plus conversion electrons, are meant
st	180° spectrometer	+,-	even, odd parity
st $\sqrt{2}$	double focusing spectrometer		
$\sigma$	cross section in barns		

Standard journal abbreviations are used.

All energies are given in Mev and all cross sections in barns unless otherwise stated in the tabular material.

#### MAGNETIC MOMENT STANDARDS

In order to have a consistent basis for recording data on magnetic moments, results have been based on the following values and are without diamagnetic corrections.

$$\mu(H^1) = 2.7934 \text{ nuclear magnetons}$$

This value has been adopted arbitrarily because it is the one used as a base in the Table of H. L. Poss, The Properties of Atomic Nuclei, I. Spins, Magnetic Moments and Electric Quadrupole Moments. (Revised, BNL-26 (T-10), (unclassified).) The values reported in the New Nuclear Data summaries are thus directly comparable with those listed in the survey of Poss.

$$\nu(Na^{23})/\nu(H^1) = 0.26450 \text{ E. Bleuler, M. Gabriel, Helv. Phys. Acta } 20, 67(1947).$$

$$\nu(D)/\nu(H^1) = 0.153506 \text{ F. Bloch, E. C. Levinthal, M. E. Pachard, Phys. Rev. } 72, 1125(1947).$$

$$\nu(B^{11})/\nu(H^1) = 0.320827 \text{ D. A. Anderson, Phys. Rev. } 76, 434(1949).$$

# NEW NUCLEAR DATA

${}^8_1\text{H}$   $\beta^-$  0.0180 log ft = 3.006 s  
Neutrino mass < 0.250 keV  
F-K plot straight down to 5.5 keV  
L.M.Langer, R.D.Moffat, Phys. Rev. 88, 169A and 689(1952).

${}^8_2\text{He}$  I 1/2 M  
G.Weinrich, V.W.Hughes, BAPS 28, 1, UA2(1953).

${}^8_2\text{He}$  Levels  $\text{He}^4(n,n)$   $E_n = 4.14$  1c  
n,  $\alpha(\theta)$  G.S.  $P_{3/2}$   
1.76  $P_{1/2}$   
P.Huber, E.Baldinger, Helv. Phys. Acta 25, 435 (1952).

Level  $\text{H}^3(d,n)\text{He}^4$   $E_n = 0.01$  to 1.73 pc  
16.65  $J = 3/2^+$   
 $\sigma_{\text{max}} = 5.1 \pm 0.1$  for  $E_d = 0.109$   
J.P.Conner, T.W.Bonner, J.R.Smith, Phys. Rev. 88, 466(1952).

Level  $\text{H}^3(d,n)\text{He}^4$   $E_d = 0.015$  to 0.125  
16.64  
 $\sigma_{\text{max}} = 4.95$  for  $E_d = 0.107$   
E.J. Stovall, Jr., W.R.Arnold, J.A.Phillips, G.A.Sawyer, J.L.Tuck, Phys. Rev. 88, 159A(1952).

Level  $\text{H}^2(t,n)\text{He}^4$   $E_t = 0.08$  to 1.2  
t, n( $\theta$ ) 16.65  $J = 3/2^+$  long counter  
 $\sigma_{\text{max}} = 4.9 \pm 0.5$  for  $E_t = 0.165$   
H.V.Argo, R.F.Taschek, H.W.Agnaw, A.Hammendinger, W.T.Leland, Phys. Rev. 87, 612(1952).

${}^8_2\text{He}$   $\tau$  0.83<sup>s</sup> pc  
 $\text{Li}^6(n,p)$   $\text{Li}^7(n,d)$   $\text{Be}(n,\alpha)$   
M.E.Battat, F.L.Ribe, Phys. Rev. 88, 159A (1952); 88, 156(1952).

$\tau$  0.84<sup>s</sup>  $\text{Be}^9(n,\alpha)$   
G.Vandryes, Ann. Phys. 7, 655(1952).

${}^8_3\text{Li}$  Level  $\text{He}^3(d,p)\text{He}^4$   $E_d = 0.19$  to 1.60 pc  
16.78  $J = 3/2^+$   
 $\sigma_{\text{max}} = 0.69$  for  $E_d = 0.400$   
T.W.Bonner, J.P.Conner, A.B.Little, Phys. Rev. 88, 473(1952).

${}^8_3\text{Li}$  No 3.58 level by  $\text{Li}^6(d,d)$   $E_d = 7.70$  s  $\pi$   
3.58 level was observed by  $\text{Li}^6(p,p)$   
C.P.Browne, C.K.Beskelman, W.W.Buechner, A.Sperduto, BAPS 28, 1, C9(1953).

${}^7_3\text{Li}$  Level  $\text{Li}^6(d,p)$   $E_d = 1.5$   
 $\gamma$  0.477 s1 pc<sup>-</sup>  
R.G.Thomas, T.Lauritsen, Phys. Rev. 88, 969(1952).

${}^7_4\text{Be}$  Level  $\text{Li}^6(d,n)$   $E_d = 1.5$   
 $\gamma$  0.429 s1 pc<sup>-</sup>  
R.G.Thomas, T.Lauritsen, Phys. Rev. 88, 969(1952).

Level  $\text{B}^{10}(p,\alpha)$   $E_p = 3.333, 1.460$  EA  
0.429  $\pm 0.003$

D.S.Craig, D.J.Donahue, K.W.Jones, Phys. Rev. 88, 808(1952).

Levels  $\text{Li}^7(d,n)$   $E_p = 18.3$  ppl  
4.6  
7.1

D.W.Thomson, Phys. Rev. 88, 954(1952).

${}^8_4\text{Be}$  Levels  $\text{B}^{11}(\gamma,t)$   $E_\gamma = 17.6$  ppl  
2.9  $\Gamma_\gamma = 1.8$   
3.4  $\pm 0.2$   $\Gamma = 0.8$   
4.05?

O.Rochat, P.Stoll, Helv. Phys. Acta 25, 451(1952).

$p,\alpha(\theta)$   $\text{Li}^7(p,\alpha)\text{He}^8$   $E_p = 0.06$  to 0.96  
 $I_p = 1$  and 3  
F.Nirat, Australian J. Sci. Res. 4A, 284(1951); 5A, 570(1952).

${}^8_4\text{Be}$  Levels  $\text{Be}(p,p)$   $E_p = 31.5$  scin  
2.5 11.6  
6.8

R.Britten, Phys. Rev. 86, 283(1952).

$\text{B}^{11}(d,\alpha n)\text{Be}^8$   $E_d = 0.425$  scin  
n's observed, assigned to 2.4 level of  $\text{Be}^9$   
G.A.Dissanalke, J.O.Newton, Proc. Phys. Soc. 65A, 675(1952).

${}^8_4\text{Be}$  Levels  $\text{Be}^9(d,p)$   $E_d = 14.3$   
d, p( $\theta$ ) G.S.  $I = 1$   
(3.37)  $I_n = 1$   
C.F.Black, BAPS 28, 1, w10(1953).

Levels  $\text{Be}^9(d,p)$   $E_d = 3.6$  1c  
d, p( $\theta$ ) G.S.  $I_n = 1$   
(3.37)  $I_n = 1$

H.W.Fulbright, J.A.Brunner, D.A.Bromley, L.W.Goldman, Phys. Rev. 88, 700(1952).



<sup>10</sup><sub>6</sub> Be Level Be(d,p)  $E_d = 1.2$   
 $\gamma$  (3.38) E1 or E2  $e^+$  spectrum  
 R.G.Thomas, T.Lauritsen, Phys. Rev. 88, 969(1952).

Levels Be(d,p)  $E_d = 3.49$  ppl  
 No states between g.s. and 3.37 level  
 F.Ajzenberg, Phys. Rev. 88, 298(1952).

d,p( $\theta$ ) graph Be(d,p)  $E_d = 0.40$  ppl  
 D.de Jong, P.M.Endt, Physica 18, 407(1952).

<sup>10</sup><sub>5</sub> B IqI 0.105 Solid B(CH<sub>3</sub>)<sub>3</sub> Mic  
 H.G.Dehmelt, Z. Phys. 133, 528(1952).

No 1.74 level by B<sup>10</sup>(d,d)  $E_d = 6.9$   $\pi$   
 1.74 level was observed by B<sup>10</sup>(d,p)  
 C.K.Bockelman, C.P.Browne, A.Sperduto, W.W. Suechner, BAPS 28, 1, CB(1953).

Levels Be(d,n)  $E_d = 3.39$  ppl  
 d,n( $\theta$ ) 0 +  
 0.72 + 5.58  
 1.75 + 5.93  
 2.15 + 6.12  
 3.53 + 6.38 -  
 4.78 6.58  
 double 5.14 - 6.77  
 Possible levels at 5.37, 5.72

F.Ajzenberg, Phys. Rev. 88, 298(1952); 87, 205A(1952); 82, 43 (1951).

Level B<sup>10</sup>(p,p)  $E_p = 2.191$  EA  
 $0.719 \pm 0.0016$   
 Level value indicates  $\tau(0.719\gamma) > 10^{-13}$   
 No other levels for  $E_p \leq 4.2$

D.S.Craig, D.J.Donahue, K.W.Jones, Phys. Rev. 88, 808(1952).

<sup>11</sup><sub>5</sub> B IqI 0.051 Solid B(CH<sub>3</sub>)<sub>3</sub> Mic  
 H.G.Dehmelt, Z. Phys. 133, 528(1952).

Levels Li<sup>7</sup>( $\alpha,\gamma$ )  

Level	I*	Level	I*
2.14	1/2 ±	8.93	3/2 +
4.46	5/2 +	9.19	7/2 +
5.03	1/2 ±	9.28	5/2 -
6.81	3/2 +		

\*From  $\gamma$  intensities,  $\alpha\gamma(\theta)$ , and  $\gamma\gamma(\theta)$

G.A.Jones, D.H.Wilkinson, Phys. Rev. 88, 423 (1952).

d,p( $\theta$ ) B(d,p)  $E_d = 0.29$  ppl  
 Graphs for g.s., 2.14, 4.46, and 5.03 levels  
 P.M.Endt, C.H.Paris, H.W.Jongerijs, F.P.G.Valeix, Physica 18, 423(1952).

<sup>12</sup><sub>6</sub> C Levels C(p,p)  $E_p = 31.5$  scin  
 4.3 9.5  
 7.5 ? 11-17 unresolved group  
 R.Britten, Phys. Rev. 88, 283(1952).

<sup>12</sup><sub>6</sub> C Level N<sup>15</sup>(d, $\alpha$ )  $E_p = 1.6$   
 $\gamma$  4.44  $\alpha$ 1 Cpt  
 $\tau < 3 \times 10^{-13}$  s Doppler correction  
 R.G.Thomas, T.Lauritsen, Phys. Rev. 88, 969(1952).

Level C<sup>12</sup>(n,n $\alpha$ )Be<sup>8</sup>g.s.  $E_n \sim 25$  cc  
 9.7  $\Gamma = 1.6$   
 J.D.Jackson, D.I.Wanklyn, BAPS 28, 1, W6(1953).

Levels B<sup>11</sup>(d, $\alpha$ )Be<sup>8</sup>  $E_p = 0.13$  to 0.28  
 d, $\alpha$ ( $\theta$ ) (16.11) 2 +  $i_p = 1$  pc  
 (~16.17) 1 - ?  $i_p = 0$

D.W.Thomson, A.V.Cohen, A.P.Franch, G.W.Hutchinson, Proc. Phys. Soc. 65A, 745(1952).

d, $\gamma$ ( $\theta$ ) B<sup>11</sup>(d, $\gamma$ )  $E_p = 0.50$   
 11.8-Mev  $\gamma$  originates from I = 1- level  
 16.3-Mev  $\gamma$  originates from I = 2+ level  
 H.Glättli, P.Stoll, Helv. Phys. Acta 25, 455 (1952).

Resonances C<sup>12</sup>( $\gamma,\alpha$ ) ppl  
 18.4 24.5  
 21.8 29.4

F.K.Goward, J.J.Wilkins, Proc. Phys. Soc. 65A, 671(1952).

<sup>13</sup><sub>6</sub> C Level C(d,p)  $E_d = 1.5$   
 $\gamma$  3.082 E1  $e^+$  spectrum  $\alpha$ 1 pe-  
 $\tau < 3 \times 10^{-13}$  s Doppler correction  
 R.G.Thomas, T.Lauritsen, Phys. Rev. 88, 969(1952).

Level C<sup>13</sup>(p,p)  $E_p = 8$  s  
 3.59

J.C.Arthur, A.J.Allen, R.S.Bender, H.J.Hausman, C.J.McDole, Phys. Rev. 88, 1291(1952).

Levels C<sup>12</sup>(n,n)  $E_n = 2.6$  to 4.15  
 n,n( $\theta$ ) 7.67  $d_{3/2}$   
 7.75  $s_{1/2}$   
 Rise in  $\sigma_t$  at  $E_n = 3.6$  net resonance

P.Huber, E.Baldinger, R.Budde, Helv. Phys. Acta 25, 444(1952).

Level C<sup>12</sup>(n,n)  $E_n = 3.62$  scin  
 n,n( $\theta$ ) (8.20)  $d_{3/2}$

A.E.Remund, R.Ricamo, Helv. Phys. Acta 25, 447 (1952).

d,p( $\theta$ ) graph C(d,p)  $E_d = 0.37$  ppl  
 B.Koudijs, P.M.Endt, J.W.van der Hart, P.J.W. Palmer, Physica 18, 419(1952).

<sup>14</sup><sub>6</sub> C Level C<sup>13</sup>(d,p)  $E_d = 1.6$   
 $\gamma$  6.11  $\alpha$ 1 pe-  
 R.G.Thomas, T.Lauritsen, Phys. Rev. 88, 969(1952).

d,p( $\theta$ ) graph C<sup>13</sup>(d,p)  $E_d = 0.37$  ppl

B.Koudijs, P.M.Endt, J.W.van der Hart, P.J.W. Palmer, Physica 18, 419(1952).

<sup>14</sup>  
7 7

$\gamma$ s  $C^{13}(d,\pi\gamma)$   $E_d = 1.6$   
 0.725\* 3.38 sl pe<sup>-</sup> Cpt  
 1.638 5.05  
 2.31 5.69

\*Assignment uncertain

R.G.Thomas, T.Lauritsen, Phys. Rev. 88, 969(1952).

NO 2.31 level by N(d,d)  $E_d = 6.98$  s $\pi$   
 2.31 level was observed by N(d,p)

C.P.Browne, C.K.Bockelman, W.W.Buechner, A.Sperduto, BAPS 28, 1, C9(1953).

<sup>15</sup>  
8 7

Levels  $N^{14}(p,\alpha)20.4^{+0.11}$   $E_p = 6.6$   
 11.9 12.5 stacked foils  
 12.2 13.0

J.P.Blaeser, P.Warner, M.Sempert, Helv. Phys. Acta 25, 442(1952).

<sup>16</sup>  
8 8

Level  $O^{16}(p,p)$   $E_p = 8$  =  
 6.0  
 6.1

Doublet separation = 0.087 ± 0.010

J.C.Arthur, A.J.Allen, R.S.Bender, H.J.Hausman, C.J.McDoie, Phys. Rev. 88, 1291(1952).

Levels  $F^{19}(p,\alpha\gamma)$   $E_p = 0.874, 0.985$   
 $\alpha\gamma(\theta)$  (6.91) I = 2 + s $\pi$  scin  
 (7.12) I = 1 -

J.Seed, A.P.French, Phys. Rev. 88, 1007(1952).

Levels  $F^{19}(p,\alpha\gamma)$  D( $\gamma,p$ ) in ppl  
 $\gamma$  polarization (6.91) even  
 (7.12) odd

L.W.Fagg, S.S.Hanna, Phys. Rev. 88, 1205(1952).

Resonances  $O^{16}(\gamma,\alpha)$   $E_\gamma \leq 20$  to <70 ppl  
 22.6 29.5  
 25.8

F.K.Goward, J.J.Wilkins, Proc. Phys. Soc. 65A, 671(1952).

Resonances  $O^{16}(\gamma,\alpha)$   $E_\gamma \leq 32$  ppl  
 22\* 29?  
 25

\*Alternative modes of disintegration via Be<sup>8</sup>, C<sup>12</sup>

D.L.Livesey, C.L.Smith, Proc. Phys. Soc. 65A, 758(1952).

<sup>17</sup>  
8 8

Level  $O(d,p)$   $E_d = 1.6$   
 $\gamma$  0.871  $\alpha = 7 \times 10^{-6}$  sl pe<sup>-</sup> ce<sup>-</sup>

R.G.Thomas, T.Lauritsen, Phys. Rev. 88, 969(1952).

Levels  $F^{19}(d,\alpha)$   $E_d = 1.8, 2.0$  s  
 0.883 5.229 5.95  
 3.069 5.397 6.87  
 3.856 5.723 6.99?  
 4.567 5.875 7.37?

Relative intensities given

H.A.Watson, W.W.Buechner, Phys. Rev. 88, 1324 (1952).

<sup>18</sup>  
9 9

Resonances  $N(\alpha,p)O^{17}$   $E_\alpha = 5.30$  cc  
 1.02 2.46 3.54  
 1.58 2.74 3.80  
 1.96 3.04 4.06

M.C.Kavadeniz, Istanbul Univ. Fen Fakül. Mecmuası 17A, 1(1952).

<sup>19</sup>  
9 10

Levels  $Ne^{21}(d,\alpha)$   $E_d = 2.129$  s  
 0.113  
 0.192

C.Mielkowsky, W.Whaling, Phys. Rev. 88, 1254 (1952).

Levels  $F^{19}(p,p)$   $E_p = 8$  s  
 1.37 3.94 4.48  
 1.59 4.06 4.59  
 2.82 4.41 4.76

J.C.Arthur, A.J.Allen, R.S.Bender, H.J.Hausman, C.J.McDoie, Phys. Rev. 88, 1291(1952).

<sup>20</sup>  
9 11

$\beta^-$  5.41 F-K plot linear  
 $\gamma$  1.631  
 No  $\beta^- > 5.4$  (<1%) No  $\gamma > 1.67$  (<0.25%)  
 $F^{19}(1.8\text{-MeV } d,p)$ ; sl pe<sup>-</sup>

D.E.Alburger, Phys. Rev. 88, 1257(1952).

Level  $F^{19}(d,p)$   $E_d = 14.3$   
 $d,p(\theta)$  g.s.  $I_n = 2$   
 C.F.Black, BAPS 28, 1, W10(1953).

Levels  $F^{19}(d,p)$   $E_d = 1.5$  to 2.1 s  
 0.652 1.309 2.870 3.586 4.275  
 0.828 1.970 2.966 3.681 4.310  
 0.938 2.048 3.491 3.961 5.062?  
 1.059 2.195 3.528 4.079

Relative intensities given

H.A.Watson, W.W.Buechner, Phys. Rev. 88, 1324 (1952).

<sup>20</sup>  
10 10

Resonances  $F^{19}(p,\alpha\gamma)O^{16}$  s $\pi$  scin  

	$E_\alpha$	J
$\alpha\gamma(\theta)$	0.669	1 +
$\alpha\gamma(\theta), p\gamma(\theta)$	0.874	2 -
$\alpha\gamma(\theta)$	0.935	1 +

J.Seed, A.P.French, Phys. Rev. 88, 1007(1952).

Resonances  $F^{19}(p,\alpha)O^{16}$  g.s. pc  
 $p,\alpha(\theta)$ 

$E_\alpha$	J	Rel. Yield	$\Gamma$
1.09*		0.13*	0.03*
1.23		0.26*	0.08*
1.38	2 +	1.0	0.10*
1.73	0 +	3.0	0.10*
1.91	1 -	6.0	0.20*

E.B.Paul, R.L.Clark, W.T.Sharp, BAPS 28, 1, W8 (1953); verbal report.

<sup>21</sup> Ne 10 11	Levels d,p(θ)	<sup>Ne20</sup> (d,p)		$E_d = 7.8$	ddl
		Level	I		
		G.S.	$d_{3/2}^*$	2	
		(0.83)	$d_{5/2}^*$	2	
		(1.68)	$d_{7/2}$	0 or 1	
		(2.79)		0	

For levels at 3.73, 4.71, 5.44, 5.74, 7.30,  
 $I_n = 1$  or 2

\*From relative cross-sections

R.Middleton, C.T.Tai, Proc. Phys. Soc. 65A, 752 (1952).

<sup>22</sup> Ne 10 12	Levels	<sup>F19</sup> (α,p)		$E_a = 5.30$	ddl
		0.57			
		1.34			
		2.84			

E.Hjalmar, H.Slätis, Arkiv Fysik 4, 323(1952).

<sup>22</sup> Na 11 11	γ	(1.28)		$\alpha = 7 \times 10^{-6}$	s ce <sup>-</sup>
		G.Hinman, D.Brower, R.Leamer, BAPS 28, 1, 57 (1953).			

<sup>24</sup> Na 11 13	γ	1.3679 ± 0.0010	s π 2	pe <sup>-</sup>
		2.7535 ± 0.0010		

A.Hedgran, D.Lind, Arkiv Fysik 5, 177(1952).

$\gamma$	(1.38)	$\alpha_{pair} = 0.6 \times 10^{-4}$	E2	s1
	(2.76)	$\alpha_{pair} = 7.1 \times 10^{-4}$	E2	

S.D.Bloom, Phys. Rev. 88, 312(1952); 87, 236A(1952); 87, 181(1952).

$\gamma$	(1.38)	$\alpha_{pair} = 3 \times 10^{-5}$	E2	s1
	(2.76)	$\alpha_{pair} = 8 \times 10^{-4}$	E2	

H.Slätis, K.Slegbahn, Arkiv Fysik 4, 485(1952).

Levels	<sup>Na23</sup> (d,p)		ddl
	0.472	3.409	3.899
	0.564	3.582	3.929
	1.341	3.623	4.184
	1.844	3.648	4.202
	1.884	3.738	4.219
	2.464	3.850	4.558
	2.561		

A.Sperduto, W.W.Buechner, Phys. Rev. 88, 574 (1952).

Capture γ's	<sup>Na23</sup> (n,γ)	2 crystal	scin s
50†	0.48	5†	1.66
18†	0.86	11†	2.0
10†	1.34	24†	2.53*

†Photons per 100 n captures\*

J.T.Braid, BAPS 28, 1, 55(1953); \*verbal report.

Capture γ's	Na <sup>23</sup> (n,γ)	s1 pe <sup>-</sup> , Cpt
60†	0.475	20† 2.07
50†	0.877	30† 2.52
20†	1.75	

†Photons per 100 n captures\*

H.T.Motz, BAPS 28, 1, 48(1953); \*verbal report.

<sup>24</sup> Na 11 13	Neutron resonances 12 resonances, Γ's, J's	$E_n = 0.12$ to 1	
		P.H.Stelson, W.W.Preston, Phys. Rev. 88, 1354 (1952).	

Mg	Levels	<sup>Mg</sup> (d,p)	$E_p = 8$	s
		3.54		
		4.71		
		5.03		

H.J.Hausman, A.J.Allen, J.S.Arthur, R.S.Bender, C.J.McDole, Phys. Rev. 88, 1296(1952).

<sup>24</sup> Mg 12 12	Levels	<sup>Mg</sup> (p,p)	<sup>Al</sup> (p,α)	$E_p = 8$	s
		1.38			
	doublet	4.13			
		4.24			

G.S. α group not observed

H.J.Hausman, A.J.Allen, J.S.Arthur, R.S.Bender, C.J.McDole, Phys. Rev. 88, 1296(1952).

<sup>25</sup> Mg 12 13	Levels	<sup>Mg</sup> (p,p)		$E_p = 8$	s
		0.61	2.76	complex ?	
		1.62	3.41		
		1.98	3.91		
		2.55			

H.J.Hausman, A.J.Allen, J.S.Arthur, R.S.Bender, C.J.McDole, Phys. Rev. 88, 1296(1952).

<sup>26</sup> Mg 12 14	Levels	<sup>Na23</sup> (α,p)		$E_a = 5.30$	ddl
		0.40			
		1.72			
		2.72			

E.Hjalmar, H.Slätis, Arkiv Fysik 4, 323(1952).

		γ		py scin	
1.83 level	1.83				
2.97 level	1.14(6†)	2.97(1†)	1.83(6†)		
3.97 level	2.14	3.97(vw)	1.83		
4.35 level	1.38	1.14	1.83		

J.E.Way, B.P.Foster, BAPS 28, 1, 58(1953).

Levels	<sup>Mg</sup> (d,p)	s
	1.83	
	2.96	

H.J.Hausman, A.J.Allen, J.S.Arthur, R.S.Bender, C.J.McDole, Phys. Rev. 88, 1296(1952).

<sup>27</sup> Al 13 14	Levels	<sup>Al</sup> (n,n)	$E_n = 2.4$	scin
		0.35 ?		
		~0.9		

M.J.Poolo, Phil. Mag. 43, 1060(1952).

<sup>28</sup> Al 13 15	Levels	<sup>Al27</sup> (d,p)	$E_d \sim 8$	pc
	d,p(θ)	Level	$I_n$	
		G.S. doublet	0	
		(1.0)	0 (10%), 2 (90%)	

J.R.Molt, T.N.Marsham, Proc. Phys. Soc. 65A, 763 (1952).



$^{28}\text{Al}$	Levels	$\text{Al}(d,p)$	$E_d = 2.1$	s	ddl
13 15	0.031	2.652	3.873	4.734	5.372
	0.974	2.980	3.900	4.759	5.435
	1.015	3.006	3.932	4.837	5.735
	1.367	3.291	4.031	4.898	5.755
	1.625	3.342	4.115	4.988	5.792
	2.137	3.458	4.238	5.007	5.855
	2.198	3.532	4.307	5.128	6.011
	2.268	3.587	4.457	5.156	6.190
	2.484	3.665	4.512	5.169	6.307
	2.578	3.695	4.686	5.182	

Relative intensities given

H.A. Enge, W.W. Buechner, A. Sperduto, Phys. Rev. 88, 963 (1952).

$^{29}\text{Al}$	$\gamma$	85†	1.28	scin
13 16		15†	2.43	

No 2.04 $\gamma$  (<4%)

H. Roderick, O. Lönsjö, W.E. Meyerhof, BAPS 28, 1, 59 (1953).

$^{28}\text{Si}$	Resonances	$\text{Mg}^{24}(\alpha,p)\text{Al}^{27}$	$\text{Al}^{27}(D,\alpha)\text{Mg}^{24}$
14 14	Same $\text{Si}^{28}$ levels observed in both reactions		
	Resonances	$\text{Mg}^{24}(\alpha,\alpha)$	$E_d = 2.7$ to $3.4$

S.G. Kaufmann, G. Goldberg, L.J. Koester, F.P. Moorling, Phys. Rev. 88, 673 (1952).

$^{29}\text{Si}$	Levels	$\text{Si}(d,p)$	$E_d = 14.3$
14 15	$d,p(\theta)$	G.S. $i_n = 0$	
		(1.29) $i_n = 2$	

C.F. Black, BAPS 28, 1, W10 (1953).

$^{31}\text{Si}$	$\tau$	2.62 <sup>h</sup>		a
14 17	$\beta^-$	1.48		

A. Wannerblom, K.E. Zimen, E. Ehn, Svensk Kem. Tid. 63, 207 (1951).

$\tau$  2.62<sup>h</sup> P(d,p) chem; ic  
 L.J. de Vries, F.T.H. Veringa, J. Clay, Koninkl. Ned. Akad. Wetenschap., Proc. 55B, 303 (1952).

$^{29}\text{P}$	$\tau$	4.45 <sup>s</sup>	$\text{Si}^{28}(2.8\text{-Mev } d)$
15 14	$\gamma$	0.5% (1.28)	scin
		2.5% (2.43)	

(1.28 $\gamma$ ) (0.511 $\gamma$ ) (2.43 $\gamma$ ) (0.511 $\gamma$ )No 0.39, 0.76, 1.15, or 2.04 $\gamma$ 

H. Roderick, O. Lönsjö, W.E. Meyerhof, BAPS 28, 1, 59 (1953).

$^{31}\text{P}$	Neutron resonances	P(n,p)2.6 <sup>h</sup> Si	
15 16		$E_n = 2.05$ to $3.25$	
		2.25 2.55 2.87 3.15	
		2.37 2.70 3.02 ? 3.22	

I. Nilsson, Trans. Chalmers Univ. Technol., Gothenburg No. 125 (1952).

$^{32}\text{P}$	Levels	$\text{P}^{31}(d,p)$	$E_d = 14.3$
15 17	$d,p(\theta)$	G.S. $i_n = 2$	
		$\sim 1.2^*$ $i_n = 0^*$	

C.F. Black, BAPS 28, 1, W10 (1953); \*verbal report.

$^{32}\text{P}$	Levels	$\text{P}^{31}(d,p)$	$E_d = 7.8$	pc
15 17	$d,p(\theta)$	G.S. $i_n = 2$		
		(0.08) $i_n = 2$		
		(0.52) $i_n = 0$ (22%), 2 (78%)		
		(1.16) $i_n = 0$ (33%), 2 (67%)		
		(1.3) $i_n = 0$ (57%), 2 (43%)		

J.S. King, E.H. Beach, BAPS 28, 1, W9 (1953); verbal report.

Capture $\gamma$ 's	$\text{P}^{31}(n,\gamma)$	2 crystal	scin s
37†	0.51		
17†	1.13		
41†	2.19		

†Photons per 100 n captures\*

J.T. Braid, BAPS 28, 1, J5 (1953); \*verbal report.

$^{33}\text{P}$	$\tau$	25 <sup>d</sup>	$\text{S}^{33}(n,p)$	chem
15 18	$\beta^-$	0.246		a

No  $\gamma$  (<3.5%)

T. Westermark, Phys. Rev. 88, 573 (1952).

$^{32}\text{S}$	Levels	$\text{S}^{32}(D,p)$	$E_p = 8$	s
16 16		2.25 4.50 5.04		
		3.81 4.74 5.83		
		4.32		

J.C. Arthur, A.J. Allen, R.S. Bender, H.J. Hausman; C.J. McDole, Phys. Rev. 88, 1291 (1952); 87, 237A (1952).

$^{33}\text{S}$	Levels	$\text{S}(d,p)$	$E_d = 14.3$
16 17	$d,p(\theta)$	G.S. $i_n = 2$	
		(0.79) $i_n = 0$	

C.F. Black, BAPS 28, 1, W10 (1953).

Capture $\gamma$ 's	$\text{S}(n,\gamma)$	2 crystal	scin s
60†	0.84		
	$\sim 1.52$		
40†	2.34		

†Photons per 100 n captures\*

J.T. Braid, BAPS 28, 1, J5 (1953); \*verbal report.

$^{34}\text{Cl}$	$\tau$	32.5 <sup>m</sup>	$\text{S}(p,n)$
17 17			

N.M. Hintz, N.F. Ramsey, Phys. Rev. 88, 19 (1952).

$^{36}\text{Cl}$	Capture $\gamma$ 's	$\text{Cl}(n,\gamma)$	2 crystal	scin s
17 19		0.48 1.85*		
		0.75 2.15*		
		1.14 2.84		

J.T. Braid, BAPS 28, 1, J5 (1953); \*verbal report.

Capture $\gamma$ 's	$\text{Cl}^{35}(n,\gamma)$	scin
	0.784 2.00	
	1.15 6.2	
	1.59 7.7	

B. Hammermesh, V. Hummel, Phys. Rev. 88, 916 (1952).

Level	$\text{Cl}(d,p)$	$E_d = 6.9$
$d,p(\theta)$	G.S. $i_n = 2$	

J.S. King, W.C. Parkinson, Phys. Rev. 88, 141 (1952).

<sup>19</sup> <sub>21</sub> <sup>K</sup> <sup>40</sup>	$\epsilon/\beta^-$	0.06	ms of A
	Based on $\tau_{\text{total}} = 1.27 \times 10^8 \text{ y}$ ; assumption of 4 sample ages of $1.03 \times 10^9 \text{ y}$		
	A.K.Mousuf, Phys. Rev. 88, 150(1952).		
	D <sub>2</sub> factor corrects F-K plot		cc
	J.H.Marshall, BAPS 28, 1, S10(1953).		
	$\Delta M(\text{K}^{40} - \text{Ca}^{40})$	$= 1.30 \pm 0.07 \text{ Mev}$	ms
	$\Delta M(\text{K}^{40} - \text{A}^{40})$	$= 1.49 \pm 0.07 \text{ Mev}$	
	W.H.Johnson, Jr., Phys. Rev. 88, 1213(1952).		
<sup>19</sup> <sub>21</sub> <sup>K</sup> <sup>40</sup> ?	Capture $\gamma$ 's	K(n, $\gamma$ )	scin
		6.0	
		8.2	
	B.Hamermesh, V.Hummel, Phys. Rev. 88, 916(1952).		
<sup>20</sup> <sub>20</sub> <sup>Ca</sup> <sup>40</sup>	Level	Ca(d,p) $E_p = 7.7$	a
		3.8	
	J.A.Harvey, Phys. Rev. 88, 162A(1952).		
<sup>20</sup> <sub>21</sub> <sup>Ca</sup> <sup>41</sup>	Levels	Ca(d,p) $E_d = 14.3$	
	d,p( $\theta$ )	g.s. $I_n = 3$	
		(1.95) $I_n = 1$	
	C.F.Black, BAPS 28, 1, W10(1953); verbal report.		
<sup>20</sup> <sub>21</sub> <sup>Ca</sup> <sup>41</sup> ?	Capture $\gamma$ 's	Ca(n, $\gamma$ )	scin
		6.8	
		8.2	
	B.Hamermesh, V.Hummel, Phys. Rev. 88, 916(1952).		
<sup>20</sup> <sub>28</sub> <sup>Ca</sup> <sup>48</sup>	$\tau_{\beta\beta}$	$> 10^{14} \text{ y}$	dpl
	Assuming decay energy $\geq 2 \text{ Mev}$		
	J.H.Fremlin, M.C.Walters, Proc. Phys. Soc. 65A, 911(1952).		
<sup>21</sup> <sub>22</sub> <sup>Sc</sup> <sup>43</sup>	$\tau$	3.9 <sup>h</sup>	s
	$\beta^+(\epsilon)$ 28%	0.77	
	72%	1.18	
	$\gamma$	0.375	s pe <sup>-</sup>
	Weak 1.15 $\gamma$ probably in <sup>Sc</sup> <sup>44</sup>		
	Ca <sup>43</sup> (7-Mev p), Ca(20-Mev $\alpha$ ) chem		
	J.R.Haskins, J.E.Duval, L.S.Cheng, J.D.Kurbatov, Phys. Rev. 88, 876(1952).		
<sup>21</sup> <sub>25</sub> <sup>Sc</sup> <sup>46</sup>	Level	<sup>Sc</sup> <sup>45</sup> (d,p) $E_d = 7.8$	pc
	d,p( $\theta$ )	g.s. ? $I_n = 1$ ( $\leq 15\%$ )*, 3 ( $\geq 85\%$ )	
	J.S.King, E.H.Beach, BAPS 28, 1, W9(1953); *verbal report.		
	Capture $\gamma$ 's	Sc(n, $\gamma$ )	scin
		0.152 (20 <sup>+</sup> Sc <sup>46</sup> )	
		0.220	
		7-9 possible lines	
	No crossover of 0.152 and 0.220 $\gamma$ 's observed		
	B.Hamermesh, V.Hummel, Phys. Rev. 88, 916(1952).		

<sup>21</sup> <sub>27</sub> <sup>Sc</sup> <sup>48</sup>	$\gamma$	$\sim 100\uparrow$ 0.99	scin pe <sup>-</sup>
		$\sim 100\uparrow$ 1.32	
	No 2.29 $\gamma$ ( $< 0.1\uparrow$ )		
	W.W.Miller, Phys. Rev. 88, 916(1952).		
<sup>21</sup> <sub>27</sub> Ti	Relative abundances	TiCl <sub>4</sub> ; ms	
	A	46 47 48 49 50	
	%	7.87 7.25 73.9 5.56 5.43	
	H.C.Matthew, C.F.Pachucki, AECU-1903(1952); NSA 6, 2526(1952).		
	Capture $\gamma$ 's	Ti(n, $\gamma$ )	2 crystal scin s
		37 $\uparrow$ 0.33	
		$\sim 100\uparrow$ 1.4	
	$\uparrow$ Photons per 100 n captures*		
	J.T.Brald, BAPS 28, 1, J5(1953); *verbal report.		
	Capture $\gamma$ 's	Ti(n, $\gamma$ )	scin
		1.38	
		5.0	
		6.5-7.0	
	B.Hamermesh, V.Hummel, Phys. Rev. 88, 916(1952).		
<sup>22</sup> <sub>25</sub> <sup>Ti</sup> <sup>47</sup>	Levels	Ti <sup>46</sup> (d,p) 82.68% Ti <sup>46</sup> pc	
	10 $\uparrow$	g.s. 17 $\uparrow$ 3.09	
	34 $\uparrow$	1.40 50 $\uparrow$ 3.70	
	13 $\uparrow$	2.39 50 $\uparrow$ 4.18	
	32 $\uparrow$	2.64	
	G.F.Pleper, Phys. Rev. 88, 1299(1952).		
<sup>22</sup> <sub>26</sub> <sup>Ti</sup> <sup>48</sup>	Levels*	Ti <sup>47</sup> (d,p) 82.05% Ti <sup>47</sup> pc	
	10 $\uparrow$	g.s. 150 $\uparrow$ 4.50	
	10 $\uparrow$	1.33 180 $\uparrow$ $\sim 4.9$	
	$< 50\uparrow$	2.31 250 $\uparrow$ $\sim 5.2$	
	100 $\uparrow$	3.31	
	*Longest range p group observed may go to first excited and not g.s.		
	G.F.Pleper, Phys. Rev. 88, 1299(1952).		
<sup>22</sup> <sub>27</sub> <sup>Ti</sup> <sup>49</sup>	Levels	Ti <sup>48</sup> (d,p) 98.90% Ti <sup>48</sup> pc	
	10 $\uparrow$	g.s. 40 $\uparrow$ 2.41	
	90 $\uparrow$	1.35 120 $\uparrow$ 3.11	
	80 $\uparrow$	1.70	
	G.F.Pleper, Phys. Rev. 88, 1299(1952).		
<sup>22</sup> <sub>28</sub> <sup>Ti</sup> <sup>50</sup>	Levels	Ti <sup>49</sup> (d,p) 77.27% Ti <sup>49</sup> pc	
	10 $\uparrow$	g.s. 240 $\uparrow$ 4.88	
	10 $\uparrow$	1.58 190 $\uparrow$ 5.39	
	$< 10\uparrow$	3.0 330 $\uparrow$ 5.99	
	240 $\uparrow$	4.14	
	G.F.Pleper, Phys. Rev. 88, 1299(1952).		
<sup>22</sup> <sub>29</sub> <sup>Ti</sup> <sup>51</sup>	$\beta^-$	80% 1.9 V(n) Ti(d) chem; a,s	
		20% 2.2	
	$\gamma$	0.32	scin
	(1.9 $\beta$ ) (0.32 $\gamma$ )		
	L.Koester et al, Z. Phys. 133, 319(1952).		

<sup>51</sup> <sub>22</sub> Ti	Levels	Ti <sup>50</sup> (d,p)	84.69% Ti <sup>50</sup>	pc				
		10†	g.s.	8†	{	1.15?		
		3†	0.61		{	1.6?		
	G.F. Pieper, Phys. Rev. 88, 1299(1952).							
	No long lived Ti <sup>51</sup> activity from Ti(th n), ms Activity in Ti foil due to Ta <sup>182</sup> , chem							
	W. Forsling, A. Ghosh, Arkiv Fysik 4, 331(1951).							
<sup>48</sup> <sub>23</sub> V	β <sup>+</sup>	~95†	0.69	Sc <sup>45</sup> (α,n)	chem; s77			
		~5†	~0.82					
	γ		(0.99)		scin			
		100†	(1.32)					
		2†	(2.22)					
		(0.51γ) (0.99γ)	(0.51γ) (1.32γ)	(0.51γ) (2.2γ)				
		(1.32γ) (0.99γ)	No (0.99γ) (2.2γ)	No (1.32γ) (2.2γ)				
	γγ(θ) indicates I = 4, 2, 0							
	No ce <sup>-</sup> between 0.070 and 0.12							
	P. L. Roggenkamp, C. H. Pruett, R. G. Wilkinson, Phys. Rev. 88, 1262(1952).							
	γ	~100†	0.99		scin			
		~100†	1.32					
		1.7†	2.29					
		(0.99γ) (1.32γ)	(0.99γ) (0.51γ)					
		(1.32γ) (0.51γ)	(2.29γ) (0.51γ)					
	M. M. Miller, Phys. Rev. 88, 916(1952).							
<sup>50</sup> <sub>23</sub> V	T <sub>1/2</sub>	> 10 <sup>12</sup> Y						
	S. G. Cohen, Bull. Research Council Israel 2, 195 (1952).							
	I	6			para			
	J. M. Baker, B. Bleaney, Proc. Phys. Soc. 65A, 952 (1952).							
	I	6			para			
	C. Kikuchi, M. H. Sirvetz, V. W. Cohen, Phys. Rev. 88, 142(1952).							
<sup>51</sup> <sub>23</sub> V	I	7/2			para			
	C. Kikuchi, M. H. Sirvetz, V. W. Cohen, Phys. Rev. 88, 142(1952).							
	Levels	V(d,p)	E <sub>p</sub> = E					
		0.33	2.43	3.83				
		0.48	2.65	3.96				
		1.16	3.11	4.90				
		1.84	3.41	4.97				
		2.22	3.58					
	No level at 0.287 by (p,p)							
	H. J. Hausman, A. J. Allen, J. S. Arthur, R. S. Bender, C. J. McDole, Phys. Rev. 88, 1296(1952).							
<sup>52</sup> <sub>23</sub> V	Level	V <sup>51</sup> (d,p)	E <sub>d</sub> = 7.8	pc				
	d,p(θ)	g.s.	I <sub>n</sub> = 1 (>75%), 3 (<25%)					
	J. S. King, E. H. Beach, BAPS 28, 1, W9(1953).							
	Capture γ's	V(n,γ)		scin				
		5.3	6.8					
		5.7	7.4					
	B. Hamermesh, V. Hummel, Phys. Rev. 88, 916(1952).							
Cr	Levels	Cr(d,p)	E <sub>p</sub> = 8	s				
		0.48	3.20	3.80				
		0.81	3.46	3.99				
		2.69	3.51	4.07				
		2.79	3.65	4.78				
	H. J. Hausman, A. J. Allen, J. S. Arthur, R. S. Bender, C. J. McDole, Phys. Rev. 88, 1296(1952).							
	Capture γ's	Cr(n,γ)		scin				
		0.880	8.0-8.5					
		5-6	8.5-9.0					
	Spectrum very complex at high energies							
	B. Hamermesh, V. Hummel, Phys. Rev. 88, 916(1952).							
<sup>51</sup> <sub>24</sub> Cr	γ	21% (0.32)	α <sub>K</sub> = 0.0015	mi	pc, scin			
	No 0.267 γ							
	D. Maeder, P. Preiswerk, A. Steinemann, Helv. Phys. Acta 25, 461(1952).							
<sup>52</sup> <sub>24</sub> Cr	Levels	Cr(d,p)	E <sub>p</sub> = 8	s				
		1.45						
		2.43						
		3.99						
	Assignment from agreement with Mn <sup>52</sup> decay							
	H. J. Hausman, A. J. Allen, J. S. Arthur, R. S. Bender, C. J. McDole, Phys. Rev. 88, 1296(1952).							
<sup>53</sup> <sub>24</sub> Cr	I	3/2			para			
	μ	0.58						
	K. D. Bowers, Proc. Phys. Soc. 65A, 860(1952).							
	Level	Cr(d,p)	E <sub>d</sub> = 14.3					
	d,p(θ)	g.s.	I <sub>n</sub> = 1					
	C. F. Black, BAPS 28, 1, W10(1953).							
<sup>53</sup> <sub>24</sub> Cr ?	23 α tracks from Fe(th n)	E <sub>α</sub> ~ 5		dpl				
	J. P. Lonchamp, J. phys. radium 13, 333(1952).							
<sup>54</sup> <sub>24</sub> Cr	T <sub>1/2</sub>	> 6 x 10 <sup>15</sup> Y			dpl			
	Assuming decay energy ≥ 2 Mev							
	J. H. Fremlin, M. C. Walters, Proc. Phys. Soc. 65A, 911(1952).							
<sup>55</sup> <sub>24</sub> Cr	τ	3.52 <sup>m</sup>	Cr(n,γ)	Mn(n,p)	chem			
	β <sup>-</sup>	2.85			a			
	No γ (< 10%)							
	A. Fiammelsfeld, W. Herr, Z. Naturforsch. 7a, 649 (1952).							



Mn <sup>55</sup> 25 30	Levels	Mn <sup>55</sup> (D,D)	E <sub>p</sub> = 8	s
		0.13	2.27	3.05
		1.00	2.42	3.21
		1.30	2.59	3.31
		1.56	2.77	3.42
		1.91	2.85	3.64
H.J. Hausman, A.J. Allen, J.S. Arthur, R.S. Bender, C.J. McDole, Phys. Rev. 88, 1296 (1952).				
Mn <sup>56</sup> 25 31	γ	100† 1.81	α <sub>pair</sub> = 5.6 × 10 <sup>-4</sup>	E1 s1
		100† 2.13	α <sub>pair</sub> = 4.6 × 10 <sup>-4</sup>	E2? pē <sup>-</sup>
H. Siġtis, K. Siġbahn, Arkiv Fysik 4, 485 (1952).				
	Capture γ's	Mn <sup>55</sup> (n, γ)		scin
		0.090 5.0		
		0.190 7.2		
No crossover of 0.090 and 0.190 γ's observed				
B. Hamermesh, V. Hummel, Phys. Rev. 88, 916 (1952).				
Fe	Capture γ's	Fe (n, γ)		
		0.425		
		8.5		
Isotopic assignment uncertain				
B. Hamermesh, V. Hummel, Phys. Rev. 88, 916 (1952).				
Fe <sup>56</sup> 26 30	Level	Fe (n, n)	E <sub>n</sub> = 2.4	scin
		(0.85)		
H.J. Poole, Phil. Mag. 43, 1060 (1952).				
Fe <sup>57</sup> 26 31	Levels	Fe (d, p)	E <sub>d</sub> = 14.3	
	d, p (θ)	g.s. l <sub>n</sub> = 1		
		~1.4 l <sub>n</sub> = 1		
		~2.6 l <sub>n</sub> = 1		
C.F. Black, BAPS 28, 1, W10 (1953).				
	Capture γ's	Fe (n, γ)		
		6.0		
		7.4		
Assignment from intensities				
No line at 1.4 observed				
B. Hamermesh, V. Hummel, Phys. Rev. 88, 916 (1952).				
Fe <sup>58</sup> 26 32	τ <sub>ββ</sub>	> 3 × 10 <sup>14</sup> <sup>y</sup>		Dp1
	Assuming decay energy ≥ 2 Mev			
J.M. Franklin, M.C. Walters, Proc. Phys. Soc. 65A, 911 (1952).				
Fe <sup>59</sup> 26 33	γ	(1.10)	α = 1.8 × 10 <sup>-4</sup>	s cē <sup>-</sup>
		(1.30)	α = 1.1 × 10 <sup>-4</sup>	
G. Minnen, D. Brower, R. Leamer, BAPS 28, 1, S7 (1953).				
	β <sup>-</sup>	0.271	F-K plot linear	s1
		54% 0.462	F-K plot linear	
		0.3% 1.560	F-K plot not α or D <sub>2</sub>	
	γ	2.8% 0.191	α = 7 × 10 <sup>-3</sup>	M1
		57% 1.098	α = 1.8 × 10 <sup>-4</sup>	M1
		43% 1.289	α = 1.4 × 10 <sup>-4</sup>	E2
(0.19γ) (1.1γ) Fe <sup>58</sup> (pile n, γ); s1 cē <sup>-</sup> pē <sup>-</sup>				
γγ(θ) agrees with I = 3/2, 5/2, 7/2 scin				
F.R. Metzger, Phys. Rev. 88, 1360 (1952).				

Co	Neutron resonance		E = 1 ev to 5 kev	
	123 ev	$\sigma_0 \Gamma^2 = 2.1 \times 10^5$		
A.W.Harrison, E.R.Wiblin, Proc. Roy. Soc. 215A, 278 (1952).				
Co <sup>56</sup> 27 29	$\beta_1^+$	$\sim 3^\dagger$	0.995 Mn <sup>55</sup> (20-Mev $\alpha$ ) chem; s	
	$\beta_2^+$	$\sim 8^\dagger$	1.53	
L.S.Cheng, J.L.Dick, J.D.Kurbatov, Phys. Rev. 88, 887 (1952).				
Co <sup>57</sup> 27 30	$\beta^+$	0.320 Mn <sup>55</sup> (20-Mev $\alpha$ ) chem; s		
	$\gamma$	$< 0.018$	$\frac{a_K}{K/L}$	s $\bar{e}^-$
		0.119	$\sim 0.7$	$\sim 6.3$ M2, E3 $\bar{e}^-$
		0.133	$\sim 0.7$	$\sim 5.2$ E3 $\bar{p}^-$
L.S.Cheng, J.L.Dick, J.D.Kurbatov, Phys. Rev. 88, 887 (1952).				
Co <sup>58</sup> 27 31 72 <sup>d</sup>	$1\mu 1$	3.5*		$\gamma(\theta, T)$
	0.805 $\gamma$ is not dipole			$\gamma(\theta, T)$
*Based on I = 2				
J.M.Daniels, M.A.Grace, H.Halban, N.Kurti, F.N.H. Robinson, Phil. Mag. 43, 1297 (1952).				
	$\beta^+$	0.472 Mn <sup>55</sup> (20-Mev $\alpha$ ) chem; s		
	$\gamma$	(0.805) $\alpha_K = 2.9 \times 10^{-4}$	E2 $\bar{e}^-$ $\bar{p}^-$	
L.S.Cheng, J.L.Dick, J.D.Kurbatov, Phys. Rev. 88, 887 (1952).				
	$\gamma$	(0.805) Electric multipole		
	Polarization from low temp. aligned nuclei			
G.R.Bishop, J.M.Daniels, G.Goldschmidt, H.Halban, N.Kurti, F.N.H.Robinson, Phys. Rev. 88, 1432 (1952).				
Co <sup>60</sup> 27 33 10.7 <sup>m</sup>	$\gamma$	0.059 $\alpha_K = 35$	pc, scin	
J.H.Kahn, ORNL-1089 (1951).				
5.2 <sup>y</sup>	$1\mu 1$	3.5		$\gamma(\theta, T)$
	Value of 3.0 (Phys. Rev. 85, 688.) in error			
B.Bleaney et al., quoted by J.M.Daniels et al., Phil. Mag. 43, 1297 (1952).				
	$\gamma$	(1.17) Electric multipole		
		(1.33) Electric multipole		
	Polarization from low temp. aligned nuclei			
G.R.Bishop, J.M.Daniels, G.Goldschmidt, H.Halban, N.Kurti, F.N.H.Robinson, Phys. Rev. 88, 1432 (1952).				
	(1.17 $\gamma$ ) / (1.33 $\gamma$ ) = 0.98 $\pm$ 0.04			s $\pi$ Cpt
B.S.Dzhelepov et al, Doklady Akad. Nauk USSR 77, 233 (1951); NSA 5, 6510 (1951).				
	$\gamma\gamma(\theta)$ , $\gamma\gamma$ polarization-direction			scin
	I = 4 <sup>+</sup> , 2 <sup>+</sup> , 0 <sup>+</sup>			
R.M.Klopper, E.S.Lennox, M.L.Wiedenbeck, Phys. Rev. 88, 695 (1952).				

<sup>27</sup> Co <sup>60</sup> 33	Capture $\gamma$ 's	Co(n, $\gamma$ )	scin
		0.220 5.8 1.1 7.0 1.5	
	B.Hamermesh, V.Hummel, Phys. Rev. 88, 916(1952).		
<sup>41</sup> Ni	Relative abundances	Ni(CO) <sub>4</sub> ; ms	
	A 58 60 61 62 64		
	% 68.0 26.3 1.13 3.66 1.01		
	H.C.Matthew, C.F.Pachucki, AECU-1903(1952); NSA 6, 2526(1952).		
<sup>28</sup> Ni <sup>64</sup> 36	$\tau_{\beta\beta}$	$> 3 \times 10^{15} \text{yr}$	dpl
	Assuming decay energy $\geq 2 \text{ Mev}$		
	J.H.Framlin, M.C.Walters, Proc. Phys. Soc. 65A, 911(1952).		
<sup>63</sup> Cu	Capture $\gamma$ 's	Cu(n, $\gamma$ )	scin
		0.160 6.5-7 7-8	
	B.Hamermesh, V.Hummel, Phys. Rev. 88, 916(1952).		
<sup>29</sup> Cu <sup>62</sup> 33	$\tau$	9.80 <sup>m</sup>	
	J.Goldenberg, W.D.Sousa-Santos, E.Silva, Ciencid cultura 3, 307(1951); Chem. Abst. 46-10926(1952).		
<sup>29</sup> Cu <sup>64</sup> 35	$\beta^+ \gamma?$ No $\beta^- \gamma$		
	S.Meric, Istanbul Univ. Fen Fakült. Mecmuası 16A, 51(1951).		
<sup>30</sup> Zn <sup>70</sup> 40	$\tau_{\beta\beta}$	$> 10^{15} \text{yr}$	
	Assuming decay energy $\geq 2 \text{ Mev}$		
	J.H.Framlin, M.C.Walters, Proc. Phys. Soc. 65A, 911(1952).		
<sup>64</sup> Ga	Neutron resonances	$E_n = 5 \text{ ev to } 5 \text{ kev}$	
		94 ev 290 ev	
	A.W.Merrison, E.R.Wiblin, Proc. Roy. Soc. 215A, 278(1952).		
<sup>31</sup> Ga <sup>67</sup> 36	$\gamma$	(0.092) $\tau \sim 10^{-6} \text{ s}$ (0.18 $\gamma$ ) (0.30 $\gamma$ )	
	S.C.Fultz, R.J.Wash, R.L.Woodward, Phys. Rev. 88, 170A(1952).		
<sup>31</sup> Ga <sup>72</sup> 42	$\gamma$	64 $\uparrow$ 2.491 $\pm$ 0.002 $s\pi\downarrow 2$ pe- 100 $\uparrow$ 2.508 $\pm$ 0.002	
	A.Hedgran, D.Lind, Arkiv Fysik 5, 177(1952).		
<sup>32</sup> Ge <sup>75</sup> 43	$\tau_1$	48 <sup>s</sup> As <sup>75</sup> (n,p) Ge <sup>74</sup> (n, $\gamma$ )	scin
	$\gamma$	0.175	
	A.B.Smith, R.S.Caird, A.C.G.Mitchell, Phys. Rev. 88, 150(1952).		
<sup>82</sup> Ge	$\beta^-$	15% 0.614 86% 1.137	Ge <sup>74</sup> (n, $\gamma$ ); sl
	$\gamma$	0.265 0.408 0.572	sl pe-, scin sl ce-, scin sl Cpt, scin
	No (1.137 $\beta^-$ ) ( $\gamma$ )		
	A.B.Smith, R.S.Caird, A.C.G.Mitchell, Phys. Rev. 88, 150(1952).		
<sup>32</sup> Ge <sup>76</sup> 44	$\tau_{\beta\beta}$	$> 2 \times 10^{16} \text{yr}$	dpl
	Assuming decay energy $\geq 2 \text{ Mev}$		
	J.H.Framlin, M.C.Walters, Proc. Phys. Soc. 65A, 911(1952).		
<sup>33</sup> As <sup>76</sup> 43	$\beta^-$	3% 0.48 12% 1.76 33% 2.40 52% 2.98	As(pile n); $s\pi\downarrow 2$
	$\gamma$	0.558 $\Delta I = 2$ , yes shape $\alpha_K = 0.002$	ce-
	E.P.Tomlinson, S.L.Ridgway, Phys. Rev. 88, 170A(1952), verbal report.		
<sup>34</sup> Se <sup>77</sup> 43	$\gamma$	0.16	Se(fast n); sl ce-
	J.Orring, Arkiv Fysik 4, 469(1952).		
	$\gamma$	0.13	Se(pile n); pc, scin
	J.H.Kahn, ORNL-1089(1951).		
<sup>35</sup> Br <sup>79</sup> 44	$q(\text{Br}^{79})/q(\text{Br}^{81}) = 1.1967$	Solid C <sub>6</sub> H <sub>4</sub> Br <sub>2</sub> Mic	
	E.Manring, C.Brown, D.Williams, BAPS 28, 1, F4, (1953).		
<sup>35</sup> Br <sup>82</sup> 47	$\gamma$	368 $\uparrow$ 0.535 0.602 353 $\uparrow$ 0.750 100 $\uparrow$ 1.02 85 $\uparrow$ 1.29 40 $\uparrow$ 1.45	s
	B.Dzhelepov, A.Silant'ev, Doklady Akad. Nauk SSSR. 85, 533(1952); NSA 6-6197(1952).		
<sup>35</sup> Br <sup>84</sup> 49	$\gamma$	st 0.890 w 1.89	scin
	L.M.Langer, R.B.Duffield, Quoted by C.M.Huddle- ston, A.C.G.Mitchell, Phys. Rev. 88, 1350(1952).		
<sup>36</sup> Kr <sup>83</sup> 47	$\tau$	1.86 <sup>h</sup>	
	L.J.de Vries, F.T.H.Veringa, J.Clay, Koninkl. Ned. Akad. Wetenschap, Proc. 55B, 303(1952).		
<sup>36</sup> Kr <sup>85</sup> 49	$\beta^-$	85% 0.83	Kr(n, $\gamma$ ) U(n,f) ms; sl
	$\gamma$	85% 0.1495 $\alpha_K = 0.041$	M1 ce-
	$\gamma$ I.T. 15%	0.3050	K/LM = 7
	[ $\beta$ ] [ $e^-$ (0.15 $\gamma$ )]		
	I.Bergström, Arkiv Fysik 5, 191(1952).		
<sup>107</sup> Ag	$\beta^-$	0.666 $\Delta I = 2$ , yes shape	sl
	Kr(n, $\gamma$ ) U(n,f) ms		
	I.Bergström, Arkiv Fysik 5, 191(1952).		

<sup>88</sup> Kr 36 52	$\beta^-$	88% 12% 20%	0.52 0.97 2.7	U(n,f) ms; s1 a $\beta\gamma$ ; s1 K/LM=8 [e $^-$ (0.028 $\gamma$ )] [~0.5 $\beta$ ]; e $^-$ / $\beta$ =0.085 S.Thulin, Arkiv Fysik 4, 363(1952).
<sup>82</sup> Rb 37 49	$\beta^+$	24 $\uparrow$ 76 $\uparrow$	0.175 0.775	Br(<20-Mev $\alpha$ ); s1
	$\gamma$		0.188 0.464 0.818 0.248 0.550 1.020 0.322 0.610 1.314 0.389 0.690 1.464 0.423 0.768 $\nabla$ st	ce $^-$ , pe $^-$
				C.W.Huddleston, A.C.G.Mitchell, Phys. Rev. 88, 1350(1952).
<sup>84</sup> Rb 37 47	$\beta^+$	~3 $\uparrow$ 58 $\uparrow$ 39 $\uparrow$	0.377 0.82 1.629	Br(<20-Mev $\alpha$ ); s $\pi$ , s1 $\Delta I=2$ , yes shape scin, s $\pi$ , ce $^-$
	$\gamma$		0.890	No other $\gamma$ No $\beta^-$ (vw if present) (~0.8 $\beta^+$ )( $\gamma$ ) No (1.63 $\beta^+$ )( $\gamma$ ) C.W.Huddleston, A.C.G.Mitchell, Phys. Rev. 88, 1350(1952).
<sup>86</sup> Rb 37 49	$\beta\gamma$ polarization-direction			1.08 $\gamma$ no parity change D.R.Hamilton, A.Lemonick, F.W.Pipkin, BAPS 28, 1, 54(1953); verbal report.
<sup>87</sup> Rb 37 50	$\tau$		5.90 x 10 <sup>10</sup> $\gamma$	RbI(Tl) scin
	$\beta^-$		0.275	F-K plot not linear No ce $^-$ or $\gamma$ G.W.Lewis, Phil. Mag. 43, 1070(1952).
	$\tau$		$\geq 4.8 \times 10^{10}$ $\gamma$	4 $\pi$ counter No $\beta e^-$ I.Böhniisch, E.Muster, W.Walcher, Naturwiss. 39, 379(1952).
<sup>88</sup> Rb 37 51	$\tau$		17.7 $\gamma$	d 2.7 $\gamma$ Kr; s1
	$\beta^-$	13% 8% 76%	2.5 3.6 5.3	$\Delta I=2$ , yes shape
				S.Thulin, Arkiv Fysik 4, 363(1952).
<sup>87</sup> Sr 38 49 2.7 $\gamma$	$\tau$		2.88 $\gamma$	Sr(d) d 80 $\gamma$ Y chem
	$\gamma$		0.3882	K/LM=5.8 s G.A.Graves, L.M.Langer, R.D.Moffat, Phys. Rev. 88, 169A and 344(1952).
<sup>88</sup> Sr 38 50	$\tau_{\beta\beta}$		$> 3 \times 10^{16}$ $\gamma$	dpl Assuming decay energy $\geq 2$ Mev J.H.Framlin, W.C.Walters, Proc. Phys. Soc. 65A, 911(1952).
<sup>82</sup> Y 39 43	$\tau$		~70 $\gamma$	Y(120-Mev p) p 26 $\gamma$ Sr chem A.A.Caretto, Jr., E.O.Willg, J. Am. Chem. Soc. 74, 5235(1952).

<sup>83</sup> Y 39 44	$\tau$		3.5 <sup>h</sup>	Y(120-Mev p) p 38 <sup>h</sup> Sr chem	A.A.Caretto, Jr., E.O.Willg, J. Am. Chem. Soc. 74, 5235(1952).
<sup>85</sup> Y 39 46	$\tau$		5 <sup>h</sup>	Y(120-Mev p) p 66 <sup>d</sup> Sr chem	A.A.Caretto, Jr., E.O.Willg, J. Am. Chem. Soc. 74, 5235(1952).
<sup>87</sup> Y 39 48 14 <sup>h</sup>	$\gamma$		0.3813	K/LM=5.4 s	No ce <sup>-</sup> in region above 1 Mev G.A.Graves, L.M.Langer, R.D.Moffat, Phys. Rev. 88, 169A and 344(1952).
80 <sup>h</sup>	$\gamma$		0.4834	K/LM~7 s	G.A.Graves, L.M.Langer, R.D.Moffat, Phys. Rev. 88, 169A and 344(1952).
<sup>88</sup> Y 39 49	$\gamma$		(0.91) $\alpha_K=3.4 \times 10^{-4}$ (1.85) $\alpha_K=1.7 \times 10^{-4}$	E1 E1,M2	F.R.Metzger, H.C.Amacher, Phys. Rev. 88, 147(1952).
<sup>91</sup> Y 39 52 51 <sup>m</sup>	$\gamma$		0.5512	K/LM=6.0 s	G.A.Graves, L.M.Langer, R.D.Moffat, Phys. Rev. 88, 169A and 344(1952).
<sup>92</sup> Nb 41 51	No $\beta^-$			Nb <sup>93</sup> (20-Mev p) chem; a,s $\gamma$ ~100 <sup>†</sup> 0.933 1 <sup>†</sup> 1.84	scin H.K.Ticho, D.Green, J.R.Richardson, Phys. Rev. 86, 422(1952); 87, 195A(1952); priv. comm.
<sup>94</sup> Nb 41 53 6.6 <sup>m</sup>	$\gamma$		(0.042) $\alpha_K>100$	Nb(pile n); pc	J.H.Kahn, ORNL-1089(1951).
<sup>95</sup> Nb 41 54 90 <sup>h</sup>	$\gamma$		(0.22) K/LM=2.5	s1 ce <sup>-</sup>	V.S.Shpinal, Zhur. Eksptl' i Teoret. Fiz. 22, 255(1952); Phys. Abst. 55-8254(1952).
Mo	Neutron resonances (ev)		$E_n=1$ ev to 10 kev 46.3 $\sigma_0 \Gamma^2=400$ 75 140 ~440		E.R.Hodgson, J.F.Gallagher, E.M.Bowey, Proc. Phys. Soc. 65A, 992(1952).
<sup>93</sup> Mo 42 51 6.7 <sup>h</sup>	$\tau_1$ $\gamma$		6.95 <sup>h</sup> ~60 <sup>†</sup> 0.290 ~100 <sup>†</sup> 0.690 ~100 <sup>†</sup> 1.464	Nb(p,n) chem, rel $\sigma$ scin	G.E.Boyd, R.A.Chaple, Phys. Rev. 88, 681(1952).
<sup>100</sup> Mo 42 58	$\tau_{\beta\beta}$		$\geq 10^{15}$ $\gamma$	dpl	Assuming decay energy $\geq 2$ Mev Definite evidence of activity J.H.Framlin, W.C.Walters, Proc. Phys. Soc. 65A, 911(1952).



<sup>99</sup> Ru 44 59	I	5/2	para
	$\mu(\text{Ru}^{101})/\mu(\text{Ru}^{99}) = 1.09$		
	J.H.E.Griffiths, J.Owen, Proc. Phys. Soc. 65A, 951(1952).		
<sup>101</sup> Ru 44 57	I	5/2	para
	$\mu(\text{Ru}^{101})/\mu(\text{Ru}^{99}) = 1.09$		
	J.H.E.Griffiths, J.Owen, Proc. Phys. Soc. 65A, 951(1952).		
Rh	Neutron resonance (ev)		cryst s
	1.260		
	H.H.Landon, V.L.Sallor, H.L.Foote, Jr., BAPS 28, 1, 48(1953).		
<sup>99</sup> Rh 45 54	$\gamma$	0.286	Ru(p); $8\pi$ $\text{Ce}^-$
	S.C.Fultz, R.J.Wash, R.L.Woodward, M.L.Pool, Phys. Rev. 88, 170A(1952).		
<sup>101</sup> Rh 45 56	$\gamma$	0.144	Ru(p); $8\pi$ $\text{Ce}^-$
		0.286	
	No $\beta^+$		
	S.C.Fultz, R.J.Wash, R.L.Woodward, M.L.Pool, Phys. Rev. 88, 170A(1952).		
<sup>104</sup> Rh 45 59	$\gamma$	0.052	$\alpha \sim 25$ pc, scin
	J.H.Kahn, ORNL-1089(1951).		
<sup>104</sup> Rh 45 59	Capture $\gamma$ 's	Rh(n, $\gamma$ )	scin
		0.080	
		0.160	
	B.Hamermesh, V.Hummel, Phys. Rev. 88, 916(1952).		
<sup>105</sup> Pd 46 59	I	5/2 ?	s
	$\mu$	-0.57	
	A.Steudel, Z.Phys. 132, 429(1952).		
<sup>109?</sup> Pd 46 63	$\tau$	5 <sup>m</sup>	Pd(pile n)
	$\gamma$	0.17	$\alpha \sim 1$ scin
	J.H.Kahn, ORNL-1089(1951).		
Ag	Neutron resonance (ev)		cryst s
	5.24		
	H.H.Landon, V.L.Sallor, H.L.Foote, Jr.; BAPS 28, 1, 48(1953).		
	Neutron resonances (ev)	$E_n = 12$ ev to 5 kev	
	5.15 $\pm$ 0.03	52	
	15.9 $\sigma_0 \Gamma^2 = 23$	66	
	29.6	125	
	40		
	A.W.Merrison, E.R.Wiblin, Proc. Roy. Soc. 215A, 276(1952).		
	Neutron resonances (ev)	$E_n = 15$ to 100 ev	
	16.5	40	52 71
	30.7	43	56 88
	J.S.Levin, W.Y.Kato, W.G.Sjostrand, D.J.Hughes, BAPS 28, 1, 410(1953); verbal report.		

<sup>104</sup> Ag 47 57	$\tau$	27 <sup>m</sup>	d 59 <sup>m</sup> Cd	877
	$\beta^+$	2.70		
	$\gamma$	0.555		
	Number of weaker $\gamma$ 's tentatively assigned to $\text{Ag}^{104}$			
	F.A.Johnson, Proc. Roy. Soc. Canada 46, 135A (1952).			
<sup>110?</sup> Ag 47 63	Capture $\gamma$	Ag(n, $\gamma$ )	scin	
		0.187		
	B.Hamermesh, V.Hummel, Phys. Rev. 88, 916(1952).			
<sup>104</sup> Cd 48 56	$\tau$	59 <sup>m</sup>	Ag(50-Mev p) chem	877
	$\beta^+$	0.93		
	$\gamma$	0.0666		
		0.0835		
	W	0.1498		
	F.A.Johnson, Proc. Roy. Soc. Canada 46, 135A (1952).			
<sup>105</sup> Cd 48 57	$\tau$	55 <sup>m</sup>	Ag(35-Mev p) chem	877
	$\beta^+$	1.68		
	$\gamma$	0.0254 (K x ray?)		
		2.1		
	F.A.Johnson, Proc. Roy. Soc. Canada, 46, 135A (1952).			
<sup>114</sup> Cd 48 66	Capture $\gamma$ 's	Cd <sup>113</sup> (n, $\gamma$ )	$8\pi$ $\text{Ce}^-$	
		0.097		
		0.562		
	C.T.Hibdon, C.O.Muehlhaue, Phys. Rev. 88, 943 (1952); 87, 222A(1952).			
	Capture $\gamma$ 's	Cd(n, $\gamma$ )	sl $\text{pe}^-$	
	89 <sup>+</sup>	0.555	11 <sup>+</sup> 0.80	
	25 <sup>+</sup>	0.646	20 <sup>+</sup> 1.30	
	*Photons per 100 n captures			
	H.T.Notz, BAPS 28, 1, 48(1953); *verbal report.			
	Capture $\gamma$ 's	Cd(n, $\gamma$ )	scin	
		0.558		
		8.5		
	B.Hamermesh, V.Hummel, Phys. Rev. 88, 916(1952).			
	Capture $\gamma$ 's	Cd(n, $\gamma$ )	pair s	
	0.36 <sup>+</sup>	6.82	0.12 <sup>+</sup> 7.84	
	0.21 <sup>+</sup>	7.67	0.23 <sup>+</sup> 8.48	
	0.16 <sup>+</sup>	7.73	0.14 <sup>+</sup> 9.05	
	*Photons per 100 n captures			
	G.A.Bartholomew, B.B.Kinsey, BAPS 28, 1, 46(1953).			
<sup>116</sup> Cd 48 68	$\tau_{\beta\beta}$	$> 8 \times 10^{15}$ y	DDI	
	Assuming decay energy $\geq 2$ Mev			
	J.H.Fremlin, M.C.Walters, Proc Phys. Soc. 65A, 921(1952).			
<sup>117</sup> Cd 48 69	$\tau$	2.9 <sup>h</sup>	Cd(d,p) chem	a
	$\gamma$	1.2		
	A.H.W.Aten, Jr., M.Soeihouwer, Physica 18, 651 (1952).			



<sup>131</sup>Xe  
53 78 (0.080γ) (0.284γ) No other γγ scin  
S. Almqvist, S. A. E. Johansson, Nature 170, 583 (1952).

<sup>121</sup>Xe  
54 67 τ 40<sup>m</sup> p 1.5<sup>h</sup>I, I(240-Mev p) chem  
B. Dropesky, E. O. Willg, Phys. Rev. 88, 683 (1952).  
τ 70<sup>m</sup> I(80-Mev p) chem  
D. E. Tilley, Proc. Roy. Soc. Canada 46, 135A (1952).

<sup>122</sup>Xe  
54 68 τ 20<sup>h</sup> p 3.4<sup>m</sup>I, I(240-Mev p) chem  
B. Dropesky, E. O. Willg, Phys. Rev. 88, 683 (1952).  
τ 19.5<sup>h</sup> p 3.4<sup>m</sup>I, I(80-Mev p) chem  
D. E. Tilley, Proc. Roy. Soc. Canada 46, 135A (1952).

<sup>123</sup>Xe  
54 69 τ 1.7<sup>h</sup> p 13<sup>h</sup>I, I(240-Mev p) chem  
B. Dropesky, E. O. Willg, Phys. Rev. 88, 683 (1952).

<sup>123</sup>Xe  
54 69 τ 2.1<sup>h</sup> I(50-Mev p) chem  
D. E. Tilley, Proc. Roy. Soc. Canada 46, 135A (1952).

<sup>125</sup>Xe  
54 71 τ 18.0<sup>h</sup> Xe(pile n) ms  
ε from ratio of Auger e<sup>-</sup> to ce<sup>-</sup>  
γ 68\* 0.054 K/LM = 4.2 sl,  
1\* 0.096 K/LM = 5 ce<sup>-</sup>  
1\* 0.106 K/LM = 5  
24\* 0.187 K/LM = 4.5  
7\* 0.243 K/LM = 7  
vw 0.46 scin

\*Relative intensity of ce<sup>-</sup><sub>K</sub>

I. Bergström, Arkiv Fysik 5, 191 (1952).

<sup>127</sup>Xe  
54 73 34<sup>d</sup> τ 25<sup>d</sup> Xe(pile n) ms  
ε from ratio of Auger e<sup>-</sup> to ce<sup>-</sup><sub>K</sub>  
γ 34\* 0.057 K/LM = 6.2 sl,  
21\* 0.145 ce<sup>-</sup>  
41\* 0.170  
84\* 0.2026 K/LM = 4.7 sπ/2  
vw 0.365 scin

\*Relative intensity of ce<sup>-</sup><sub>K</sub>

I. Bergström, Arkiv Fysik 5, 191 (1952).

<sup>131</sup>Xe  
54 77 12<sup>d</sup> τ 12.0<sup>d</sup> d 8<sup>d</sup>I ms  
γ 0.1639 α<sub>K</sub> = 36 M4 sπ/2  
K/L = 2.3 L/M = 2.9

I. Bergström, Arkiv Fysik 5, 191 (1952).

stable q -0.12 s  
μ +0.683 s  
A. Bohr, J. Koch, E. Rasmussen, Arkiv Fysik 4, 455 (1952).

<sup>133</sup>Xe  
54 79 5.3<sup>d</sup> τ 5.4<sup>d</sup> Xe(pile n) U(n, f) ms  
β<sup>-</sup> 0.347 sl  
γ 0.081 α<sub>K</sub> = 1.5 M1  
K/LM = 4.9

[e<sup>-</sup>(0.08γ)] [β]

I. Bergström, Arkiv Fysik 5, 191 (1952).

<sup>135</sup>Xe  
54 81 9.2<sup>h</sup> τ 9.2<sup>h</sup> Xe(pile n) U(n, f) ms  
β<sup>-</sup> 0.91 sl  
γ 100† 0.25 α<sub>K</sub> = 0.054 M1, E2  
6† 0.61 K/LM = 6.5 sl ce<sup>-</sup> scin  
[e<sup>-</sup>(0.28γ)] [β]

0.053, 0.148, 0.190 γ's not found

I. Bergström, Arkiv Fysik 5, 191 (1952).

<sup>128</sup>Cs  
55 73 τ 3.8<sup>m</sup> d 2.4<sup>d</sup>Ba chem  
β<sup>+</sup> observed with 2.4<sup>d</sup>Ba belongs to this daughter

M. Lindner, R. N. Osborne, Phys. Rev. 88, 1422 (1952).

<sup>134</sup>Cs  
55 79 2.3<sup>y</sup> β<sup>-</sup> 22% 0.085\* Cs(slow n); s  
6% 0.28\*  
9% 0.42\*  
65% 0.65\*  
γ 137† (~0.58) 3† 1.15 s pe<sup>-</sup>  
100† 0.788 3† 1.35  
~2† ~1.0

K. Gromov, B. Dzhelepov, Doklady Akad. Nauk SSSR 85, 299 (1952). \*N. Anton'eva et al., ibid.

γγ(θ), γγ polarization-direction scin  
I = 4+, 2+, 0+

R. M. Kloepper, E. S. Lennox, M. L. Wiedenbeck, Phys. Rev. 88, 695 (1952).

γγ polarization correlation observed  
Consistent with 5±, 4+, 2+, 0+

B. L. Robinson, L. Madansky, Phys. Rev. 88, 1065 (1952).

<sup>135</sup>Cs  
55 80 β<sup>-</sup> 0.210\* ΔI = 2, no shape s  
L. Ildofsky, E. Alperovitch, C. S. Wu, BAPS 28, 1, 22 (1953); verbal report.

<sup>137</sup>Cs  
55 82 γ 0.6614 K/LM = 4.6 s  
G. A. Graves, L. M. Langer, R. D. Moffat, Phys. Rev. 88, 169A and 344 (1952).

γ 0.66165 sπ/2 ce<sup>-</sup> pe<sup>-</sup>  
± 0.00015

G. Lindström, K. Siegbahn, A. H. Wapstra, Proc. Phys. Soc. 66B, 54 (1953).

γ 0.66160 cryst  
± 0.00014

D. E. Muller, H. C. Hoyt, D. J. Klein, J. W. M. Du Mond, Phys. Rev. 88, 775 (1952).

<sup>127</sup>Ba  
56 71 τ 12<sup>m</sup> p 5.6<sup>h</sup>Cs, Cs(190-Mev d)  
M. Lindner, R. N. Osborne, Phys. Rev. 88, 1422 (1952).

<sup>128</sup>Ba  
56 72 ε ~100% Cs(190-Mev d) chem  
β<sup>+</sup> in 3.8<sup>m</sup>Cs daughter

M. Lindner, R. N. Osborne, Phys. Rev. 88, 1422 (1952).



56	Ba <sup>131</sup> 75	$\gamma$	Ba(pile n); s	
			$\alpha_K$	K/LM
			0.043	
			0.065	~3.5
			0.108	~7
			0.122	6.0
	10†		0.214	~0.18 2.8 E2 ce, pe-
	4†		0.241	
	7†		0.370	~0.010 E1
	100†		0.494	~0.0045 2.5 E2

M.W.Elliott, L.S.Chen, J.R.Haskins, J.D.Kurbatov, Phys. Rev. 88, 263(1952).

56	Ba <sup>138</sup> 82	$\tau_{\beta\beta}$	$> 10^{15} \text{yr}$		Dp1
			Assuming decay energy $\geq 2 \text{ Mev}$		

J.H.Fremlin, M.C.Walters, Proc. Phys. Soc. 65A, 911(1952).

57	La <sup>140</sup> 83	$\gamma$	0.3286 $\pm$ 0.0003	$s\pi \downarrow_2 p e^-$
			0.4867 $\pm$ 0.0004	
			0.8151 $\pm$ 0.0007	
			1.596 $\pm$ 0.002	

A.Hedgran, D.Lind, Arkiv Fysik 5, 177(1952).

Capture $\gamma$		La(n, $\gamma$ )	scin
		4.5	

B.Hamermesh, V.Hummel, Phys. Rev. 88, 916(1952).

58	Ce <sup>143</sup> 85	$\beta^-$	100†	0.71	Ce <sup>142</sup> (pile n, $\gamma$ ),
			183†	1.090	U (pile n, f) chem
			100†	1.390	
		$\gamma$	~20†	0.128	s1 pe-, scin
				~0.160	
			100†	0.290	
			~20†	0.356	
			~25†	0.660	
				0.72	

Unresolved lower energy  $\beta$   
(0.126 $\gamma$ ) (0.180 $\gamma$ )  
W.H.Burgus, Phys. Rev. 88, 1129(1952).

59	Pr <sup>141</sup> 82	I	5/2		para

C.F.Davis et al, Atti accad. nazl. Lincei, Classe sci. fis. mat. e nat. 11, 77(1951). NSA 6-3679.

61	Pm <sup>142</sup> 81	$\tau$	260 <sup>d</sup>		Nd <sup>142</sup> (7-Mev p)

J.K.Long, M.L.Pool, D.N.Kundu, Phys. Rev. 88,  
171A(1952).

61	Pm <sup>143</sup> ?	$\tau$	320 <sup>d</sup>	Nd <sup>143</sup> (7-Mev p)

J.K.Long, M.L.Pool, D.N.Kundu, Phys. Rev. 88, 171A(1952).

61	Pm <sup>145</sup> 84	$\tau$ $\beta^+$	16 <sup>d</sup>	Nd <sup>145</sup> (7-Mev p)
			0.45	

J.K.Long, M.L.Pool, D.N.Kundu, Phys. Rev. 88, 171A(1952).

61	Pm <sup>146</sup> 85	$\tau$	~2 <sup>y</sup>		Nd <sup>146</sup> (7-Mev p)
			$\beta^-$	0.75	

J.K.Long, M.L.Pool, D.N.Kundu, Phys. Rev. 88, 171A(1952).

62	Sm <sup>150</sup> 88	Capture $\gamma$ 's	Sm <sup>149</sup> (n, $\gamma$ )	s $\pi$ ce-
			0.337	
			0.440	K/L ~ 4.4
				K/L ~ 3

C.T.Hibdon, C.O.Muehlhaue, Phys. Rev. 88, 943 (1952); 87, 222A(1952).

62	Sm <sup>151</sup> 89	$\beta^-$	~0.075	Sm(th n); pc
			0.019	
		$\gamma$	(0.019 $\gamma$ ) ( $\beta^-$ )	pc
				scin

H.W.Wilson, G.W.Lewis, Proc. Phys. Soc. 65A, 656 (1952).

63	Eu <sup>155</sup> 92	$\beta^-$	~0.150	Sm(th n, $\gamma$ $\beta^-$ ); pc
			~0.250	
		$\gamma$	0.015	pc
			(~0.150 $\beta^-$ ) ( $\gamma$ ) ( $\beta^-$ ) (0.015 $\gamma$ )	

H.W.Wilson, G.W.Lewis, Proc. Phys. Soc. 65A, 656 (1952).

64	Gd <sup>153</sup> 89	$\gamma$	0.1037	K/L = 5 s $\pi$ ce-
			No other $\gamma$	
				Gd(pile n)

J.W.Cork, J.M.LeBlanc, W.H.Nester, F.B.Stumpf, Phys. Rev. 88, 685(1952).

64	Gd <sup>156</sup> 158	Capture $\gamma$ 's	Gd(n, $\gamma$ )	s $\pi$ ce-
			0.079	
			0.088	K/L ~ 0.3 L/M ~ 2.5
			0.180	

C.T.Hibdon, C.O.Muehlhaue, Phys. Rev. 88, 943 (1952); 87, 222A(1952).

65	Tb <sup>161</sup> 96	$\tau$	6.8 <sup>d</sup>	Gd(pile n); s $\pi$ ce-
			0.049	
		$\gamma$		L/M = 3.7
		No other $\gamma$		

J.W.Cork, J.M.LeBlanc, W.H.Nester, F.B.Stumpf, Phys. Rev. 88, 685(1952).

66	Dy <sup>165</sup> 99	$\gamma$	0.102	Dy(pile n); scin

J.H.Kahn, ORNL-1089(1951).

Capture $\gamma$ 's		Dy(n, $\gamma$ )	s $\pi$ ce-
		0.082	
		0.106	
		0.189	

C.T.Hibdon, C.O.Muehlhaue, Phys. Rev. 88, 943 (1952); 87, 222A(1952).

Ho	Neutron resonances (ev)	$E_n = 0.1$ to 30 ev	
		3.96	cryst s
		12.8	

H.L.Foote, Jr., V.L.Sallor, H.H.Landon, BAPS 28, 1, M7(1953).

Er	Neutron resonances (ev)	$E_n = 0.1$ to 30 ev	
		0.51	9.55 21.2 cryst s
		6.10	16.0 27.5

H.L.Foote, Jr., V.L.Sallor, H.H.Landon, BAPS 28, 1, M7(1953).

Er <sup>167</sup> 68 99	1Q1	10.2	para
	G.S.Bogle, H.J.Duffus, H.E.D.Scovill, Proc. Phys. Soc. 65A, 760(1952).		
Tm	Neutron resonances (ev)	$E_n = 0.1$ to 30 ev	
		3.96	cryst s
		15.0	
		18.0	
	H.L.Foote, Jr., V.L.Sallor, H.M.Landon, BAPS 28, 1, M7(1953).		
Tm <sup>170</sup> 69 101	$\beta^-$	24% 0.884	Tm(pile n); sl $\beta\gamma$
		76% 0.968	sl
	$\gamma$	0.0841	$\tau = 1.57 \times 10^{-9}$ s
		$\alpha_K = 1.6$ $\alpha_L = 4.1$ $\alpha_M = 1.2$	E2
		$\epsilon_K < 0.3\%$ ( $\beta$ ) (0.084 $\gamma$ )	
		No other $\gamma$ 's (<0.02%)	
		F-K plots of both $\beta$ 's linear	
	R.L.Graham, J.L.Wolfson, R.E.Bell, Can. J. Phys. 30, 459(1952).		
Yb 70 6 <sup>s</sup>	$\gamma$	0.21	Yb(pile n); scin
		0.10	(Dy impurity?)
	J.H.Kahn, ORNL-1089(1951).		
Lu	Neutron resonances (ev)	$E_n = 0.1$ to 30 ev	
		1.57 5.3 14.4	cryst s
		2.62 11.4 24.0	
		4.80	
	H.L.Foote, Jr., V.L.Sallor, H.M.Landon, BAPS 28, 1, M7(1953).		
Lu <sup>176</sup> 71 105	Neutron resonance (ev)	cryst s	
		0.142	
	H.L.Foote, Jr., V.L.Sallor, H.M.Landon, BAPS 28, 1, M7(1953); verbal report.		
Hf <sup>179</sup> 72 107	$\gamma$	0.22	Hf(pile n); scin
19 <sup>s</sup>	J.H.Kahn, ORNL-1089(1951).		
Ta <sup>181</sup> 73 108	$\mu$	1.9	S
	q	+5.9	
	B.M.Brown, D.H.Tamboullian, Phys. Rev. 88, 1158(1952).		
Ta <sup>182</sup> 73 109	$\gamma$	0.9† 0.065714 1.9† 0.17936	
		10.0† 0.067736 0.9† 0.19830	
		0.6† 0.084667 4.5† 0.22205	
		4.6† 0.10009 2.4† 0.22927	
		0.9† 0.11366 2.7† 0.26409	
		0.2† 0.11640 35.2† 1.121	
		4.3† 0.15241 15.7† 1.188	
		1.4† 0.15637 33.4† 1.223	
	No Hf x ray Ta(pile n), cryst		
	Possible decay schemes enumerated		
	D.E.Muller, H.C.Hoyt, D.J.Klein, J.W.W.DuMond, Phys. Rev. 88, 775(1952).		

W <sup>186</sup> 74 112	$\tau_{\beta\beta}$	$> 6 \times 10^{15}$ y	ddl
	Assuming decay energy $\geq 2$ Mev		
	J.H.Framlin, M.C.Walters, Proc. Phys. Soc. 65A, 911(1952).		
W <sup>187</sup> 74 113	$\gamma$	0.07200	cryst
		0.13425	
		0.4795	
		0.6189	
		0.6861	
	0.6189 $\gamma$ not crossover		
	D.E.Muller, H.C.Hoyt, D.J.Klein, J.W.W.DuMond, Phys. Rev. 88, 775(1952).		
	$\gamma$	0.072	$\alpha_K \sim 2^*$ $\alpha < 2.5^*$ E1 pc
		0.134	$\alpha_K \sim 2^*$ M1
		0.440	
		0.552	
		0.686	E1
		0.78	
	(0.48 $\gamma$ )(0.13 $\gamma$ ) (0.55 $\gamma$ )(0.13 $\gamma$ ) (0.78 $\gamma$ )(0.13 $\gamma$ )		
	No (0.618 $\gamma$ ) ( $\gamma$ )		
	No 0.205 $\gamma$ (<3% of 0.134 $\gamma$ )		
	0.48 $\gamma$ precedes 0.072 $\gamma$		
	A.W.Sunyar, BAPS 28, 1, Z3(1953);* verbal report.		
Re	Neutron resonance (ev)	cryst s	
		2.16	
	H.M.Landon, V.L.Sallor, H.L.Foote, Jr., BAPS 28, 1, M8(1953).		
Os <sup>185</sup> 76 109	$\gamma$	0.654	Os (pile n); sl ce <sup>-</sup>
		0.78	
	J.B.Swan, R.D.Hill, Phys. Rev. 88, 831(1952).		
Os <sup>191</sup> 76 115	$\tau_1$	14 <sup>h</sup>	Os ( $\leq 22$ -Mev $\gamma$ ) Os (pile n)
	No $\beta^-$ (<5%)		$8\pi$
	$\gamma$ I.T.	0.0742	$8\pi$ ce <sup>-</sup> (Os)
		$L_1 : L_2 : L_3 : M_1 : M_2 : N$	
		42 : 24 : 100 : 14 : 35 : 15	
	J.B.Swan, R.D.Hill, Phys. Rev. 88, 831(1952).		
	$\gamma$	(0.074)	E3(73%) M4(27%)
	From $\alpha_L$ 's, $e_L^-(0.074 \text{ I.T. } \gamma)/e_L^-(0.13 \text{ g.s. } \gamma)$ , and (Os K x ray)/(Ir K x ray) when produced by Os(n, $\gamma$ )		
	R.D.Hill, J.W.Wilhelich, Phys. Rev. 89, 323(1953).		
15.0 <sup>d</sup>	$\tau_2$	15 <sup>d</sup>	Os ( $\leq 22$ -Mev $\gamma$ ) Os (pile n)
	$\beta^-$	$\sim 0.14$	$8\pi$
	$\gamma_1$	50%* 0.0417	E2
	$\gamma_2$	100%* 0.1291	M1, E2
		$K : L_1 : L_2 : L_3 : M_1 : M_2 : M_3 : N$	
		32 : 40 : — : 11 : 19 : 9.6	
	$\gamma_2$	100 : 30 : 11 : 6.0 : — : 12 : — : 3.5	
	$[e_L^-(0.129\gamma)] [e_L^-(0.042\gamma)]$		
	*Assuming M1/E2 = 3 for 0.129 $\gamma$		
	J.B.Swan, R.D.Hill, Phys. Rev. 88, 831(1952).		

**Os<sup>192</sup>**  $\tau_{\beta\beta} > 10^{14} \text{y}$  dpl  
 76 116 Assuming decay energy  $\geq 2 \text{ Mev}$   
 J.H.Framlin, M.C.Walters, Proc. Phys. Soc. 65A,  
 911(1952).

**Os<sup>193</sup>**  $\tau$  32<sup>h</sup> Os(pile n),  
 76 117  $\beta^-$   $\sim 1$  not Os ( $\leq 22\text{-Mev } \gamma$ ); a  
 Weak  $\gamma$ 's with  $14^h < \tau < 15^d$   
 $\sim 0.085 \quad 0.215 \quad 0.323 \quad 0.460$   
 J.B.Swan, R.D.Hill, Phys. Rev. 88, 831(1952).

**Ir** Neutron resonance (ev) cryst s  
 0.654

H.M.Landon, V.L.Sallor, H.L.Foote, Jr., BAPS 28,  
 1, W8(1953).

**Ir<sup>192</sup>**  $\gamma$  (0.057)  $a_L > 400$  Ir(pile n); pc  
 77 115 Ir L x ray but no unconverted  $\gamma$  found  
 1.4<sup>m</sup> J.H.Kahn, ORNL-1089(1951).

$\gamma$  0.4<sup>†</sup> 0.13633 30.0<sup>†</sup> 0.46798  
 1.0<sup>†</sup> 0.20131 1.1<sup>†</sup> 0.4848  
 7.5<sup>†</sup> 0.20574 1.1<sup>†</sup> 0.5884  
 38.0<sup>†</sup> 0.29594 1.4<sup>†</sup> 0.6045  
 37.0<sup>†</sup> 0.30845 0.5<sup>†</sup> 0.6129  
 99.0<sup>†</sup> 0.31646

Os K x ray Pt K x ray Ir(pile n), cryst  
 Level scheme given

D.E.Muller, M.C.Hoyt, D.J.Klein, J.W.M.DuMond,  
 Phys. Rev. 88, 775(1952).

$\gamma$  2<sup>+</sup> 0.200 100<sup>+</sup> 0.467 sl pe<sup>-</sup>  
 3<sup>+</sup> 0.205 5<sup>+</sup> 0.486  
 50<sup>+</sup> 0.295 10<sup>+</sup> 0.589  
 50<sup>+</sup> 0.307 30<sup>+</sup> 0.606  
 100<sup>+</sup> 0.315

J.L.Wolfson, Proc. Roy Soc. Canada 44, 193A  
 (1950).

**Pt<sup>198</sup>**  $\tau_{\beta\beta} > 10^{15} \text{y}$  dpl  
 78 120 Assuming decay energy  $\geq 2 \text{ Mev}$

J.H.Framlin, M.C.Walters, Proc. Phys. Soc. 65A,  
 911(1952).

**Au** Neutron resonance (ev) cryst s  
 4.93

H.M.Landon, V.L.Sallor, H.L.Foote, Jr., BAPS 28,  
 1, W8(1953).

Neutron resonance  
 4.85 ev

A.W.Harrison, E.R.Wiblin, Proc. Roy. Soc. 215A,  
 278(1952).

**Au<sup>195</sup>**  $\tau$  30<sup>s</sup> d 38<sup>h</sup> Hg chem  
 79 116  $\gamma$  0.056 sl ce<sup>-</sup>  
 30<sup>a</sup> 0.259

O.Huber, R.Joly, P.Scherer, N.F.Verster, Helv.  
 Phys. Acta 29, 621(1952).

**Au<sup>198</sup>**  $\beta^-$  0.958 sl  
 79 119 1.370  $\Delta I = 3$ , yes

J.L.Wolfson, L.G.Elliott, Proc. Roy. Soc. Canada  
 46, 142A(1952).

$\gamma$  0.411770  $\pm 0.000036$  cryst

D.E.Muller, M.C.Hoyt, D.J.Klein, J.W.M.DuMond  
 Phys. Rev. 88, 775(1952).

$\gamma$  0.41173  $\pm 0.00007$   $\pi\pi^0 2 \text{ ce}^-$   
 Compared with 0.51084 Th L line in Tl<sup>208</sup>

A.Hedgran, D.Lind, Arkiv Fysik 5, 177(1952).

**Au<sup>200</sup>**  $\tau$  48<sup>m</sup> Hg<sup>201</sup> ( $\leq 28\text{-Mev } \gamma$ ) chem  
 79 121  $\beta^-$  2.2 a  
 $\gamma$  0.39 scin  
 1.13

$\beta/\gamma = 5$

F.D.S.Butement, R.Shillito, Proc. Phys. Soc. 65A,  
 945(1952).

**Au<sup>201</sup>**  $\tau$  26<sup>m</sup> Hg<sup>202</sup> ( $\leq 28\text{-Mev } \gamma$ ) chem  
 79 122  $\beta^-$  1.5 a  
 $\gamma$  0.55 scin  
 $\beta/\gamma = 20$

F.D.S.Butement, R.Shillito, Proc. Phys. Soc. 65A,  
 945(1952).

**Au<sup>202</sup>?**  $\tau$   $\sim 25^s$  Hg(18-Mev n) chem  
 79 123 F.D.S.Butement, R.Shillito, Proc. Phys. Soc. 65A,  
 945(1952).

**Au<sup>203</sup>**  $\tau$  55<sup>s</sup> Hg<sup>204</sup> ( $\leq 28\text{-Mev } \gamma$ ) chem  
 79 124  $\beta^-$  1.9 a  
 $\gamma$  0.69 scin  
 $\beta/\gamma = 10$

F.D.S.Butement, R.Shillito, Proc. Phys. Soc. 65A,  
 945(1952).

**Hg** Neutron resonances (ev)  $E_n = 3 \text{ ev to } 10 \text{ kev}$

$E_n$	$\sigma_n \Gamma^2$
23.3	9
35.4	170

191

$\sim 350$

E.R.Hodgson, J.F.Gallagher, E.M.Boway, Proc.  
 Phys. Soc. 65A, 992(1952).

**Hg<sup>195</sup>**  $\gamma$  0.036 Au(25-Mev d) chem  
 80 115  $\gamma$  I.T. 0.122 sl ce<sup>-</sup>  
 38<sup>h</sup> O.Huber, R.Joly, P.Scherer, N.F.Verster, Helv.  
 Phys. Acta 25, 621(1952).

9.5<sup>h</sup>  $\tau_2$  9.5<sup>h</sup> Au(25-Mev d) chem  
 $\gamma$  0.061 sl ce<sup>-</sup>  
 ce<sup>-</sup> 0.099

O.Huber, R.Joly, N.F.Verster, Helv. Phys. Acta  
 25, 621(1952).



<sup>80</sup> Hg <sup>200</sup> 120	Capture $\gamma$	Hg <sup>199</sup> (n, $\gamma$ ) ~0.28	s $\pi$ ce <sup>-</sup>	<sup>82</sup> Pb <sup>212</sup> 130	$\tau$	10.67 <sup>h</sup>	H. Buttar, Naturwiss. 39, 575(1952).
		C.T. Hibdon, C.O. Muehlhause, Phys. Rev. 88, 943 (1952); 87, 222A(1952).			$\gamma$	0.23860	cryst
<sup>81</sup> Tl <sup>204</sup> 123	$\beta^-$	98.5% 0.760 $\Delta I=2$ , yes shape 4 $\pi$ scin $\epsilon$ ~1.6%		<sup>82</sup> Pb <sup>214</sup> 132	$\gamma$	0.053226 Rn <sup>222</sup> source, cryst 20 <sup>+</sup> 0.24192 55 <sup>+</sup> 0.29522 100 <sup>+</sup> 0.35189	
		E <sub>d1s</sub> ( $\epsilon$ ) ~0.4 (calc) NO 0.37 $\gamma$ (<10 <sup>-2</sup> %) E. der Mateosian, A. Smith, Phys. Rev. 88, 1186 (1952).					D.E. Muller, H.C. Hoyt, D.J. Klein, J.W.M. DuMond, Phys. Rev. 88, 775(1952).
<sup>81</sup> Tl <sup>208</sup> 127	$\gamma$	(2.62) $\alpha_{\text{pair}} = 4.3 \times 10^{-4}$ E2 s H. Sieltis, K. Siegbahn, Arkiv Fysik 4, 485(1952).		<sup>83</sup> Bi <sup>209</sup> 126	$\tau$	$2 \times 10^{17}$ y	dpl
	$\gamma$	0.06 <sup>+</sup> 0.27735 Th <sup>228</sup> source, cryst 0.15 <sup>+</sup> 0.5108 0.40 <sup>+</sup> 0.5830 0.2408 $\gamma$ (0.10 <sup>+</sup> ) unassigned $\uparrow$ Relative to 0.238 $\gamma$ of Pb <sup>212</sup> D.E. Muller, H.C. Hoyt, D.J. Klein, J.W.M. DuMond, Phys. Rev. 88, 775(1952).			$\alpha$	2.9	
<sup>81</sup> Tl <sup>209</sup> 128	$\beta^-$	1.99 d 10 <sup>d</sup> Ac; s F. Wagner, Jr., M.S. Freedman, D.W. Engelkemir, L.B. Magnusson, Phys. Rev. 88, 171A(1952).				7 $\alpha$ tracks, E <sub>a</sub> = 2.9, in Bi impregnated plate kept 100 days in N <sub>2</sub> , 18°C W. Riezler, W. Porschen, Z. Naturforsch. 7a, 634 (1952).	
FB	Variations in relative isotopic abundances	C.B. Collins, R.W. Farquhar, R.D. Russell, Phys. Rev. 88, 1275(1952).				Very few low energy $\alpha$ 's in Bi loaded plate $\tau$ of $2 \times 10^{17}$ y, E <sub>a</sub> of 3 Mev not confirmed E.P. Hinkle, C.H. Millar, Proc. Roy. Soc. Canada 46, 143A(1952).	
<sup>82</sup> Pb <sup>201</sup> ? 119	$\tau_1$	50 <sup>s</sup> Tl(p) chem, not Hg(p) $\gamma$ ~1 <sup>+</sup> 0.25 scin ~1 <sup>+</sup> 0.42 ~4 <sup>+</sup> 0.67 N.J. Hopkins, Phys. Rev. 88, 680(1952).		<sup>83</sup> Bi <sup>210</sup> 127	No ce <sup>-</sup> , no nuclear $\gamma$	pc s $\pi$	
50 <sup>s</sup>						C.S. Wu, F. Boehm, E. Nagel, BAPS 28, 1, 24(1953).	
<sup>82</sup> Pb <sup>202</sup> ? 120	$\tau_1$	5.6 <sup>s</sup> Tl(p), not Hg(p) $\gamma$ 0.89 scin N.J. Hopkins, Phys. Rev. 88, 680(1952).		<sup>83</sup> Bi <sup>212</sup> 129	$\gamma$ 0.15 <sup>+</sup> 0.729 Th <sup>228</sup> source, cryst $\uparrow$ Relative to 0.238 $\gamma$ of Pb <sup>212</sup> D.E. Muller, H.C. Hoyt, D.J. Klein, J.W.M. DuMond, Phys. Rev. 88, 775(1952).		
5.6 <sup>s</sup>						(6.04 $\alpha$ ) (0.04 $\gamma$ ) ( $\theta$ ) b=1.30 I=1,3,4 or 1,4,5 J. Horton, R. Sherr, BAPS 28, 1, 25(1953).	
<sup>82</sup> Pb <sup>207</sup> 125	$\tau_1$	0.80 <sup>s</sup>		<sup>83</sup> Bi <sup>213</sup> 130	$\beta^-$	0.96 d 10 <sup>d</sup> Ac chem; s 1.39 $\gamma$ 0.120 0.435 (1.39 $\beta$ ) (0.12 $\gamma$ ) F. Wagner, Jr., M.S. Freedman, D.W. Engelkemir, L.B. Magnusson, Phys. Rev. 88, 171A(1952).	
0.8 <sup>s</sup>							
<sup>82</sup> Pb <sup>209</sup> 127	$\beta^-$	0.63 d 10 <sup>d</sup> Ac chem; s, scin F. Wagner, Jr., M.S. Freedman, D.W. Engelkemir, L.B. Magnusson, Phys. Rev. 88, 171A(1952).		<sup>83</sup> Bi <sup>214</sup> 131	$\gamma$ 1.6 <sup>+</sup> 0.6094 Rn <sup>222</sup> source, cryst $\uparrow$ Relative to 0.352 $\gamma$ of Pb <sup>214</sup> D.E. Muller, H.C. Hoyt, D.J. Klein, J.W.M. DuMond, Phys. Rev. 88, 775(1952).		
<sup>82</sup> Pb <sup>210</sup> 128	$\gamma$	0.04652 cryst No other $\gamma$ 's from 0.016 to 0.062 (<2%) G.T. Ewan, M.A.S. Ross, Nature 170, 760(1952).			$\gamma(\theta)$	b ~0.3 F. Demichels, R. Malvano, Nuovo Cimento 9, 1106 (1952).	
<sup>82</sup> Pb <sup>210</sup> 128	$\gamma$	~10 <sup>+</sup> 0.0464 $\alpha$ =8.5 dpl L <sub>I</sub> : L <sub>II</sub> : L <sub>III</sub> : M : NO 100 : 7.5 : 0.7 : 28 : 7.7 No other $\gamma$ (<0.5%) $\uparrow$ Photons per 100 disintegrations C.S. Wu, F. Boehm, E. Nagel, BAPS 28, 1, 24(1953); verbal report.		<sup>88</sup> Ra <sup>226</sup> 138	$\alpha$ 5.7% (4.611) s, dpl No $\alpha$ 's from 3.6 to 4.4 (<0.02%)* F. Asaro, I. Periman, Phys. Rev. 88, 129(1952). *A. Ghiorso, ibid.		



$\gamma$	$40^+$	0.039	pc
	$140^+$	0.053	sl ce <sup>-</sup> , pc
	$110^+$	0.100	scin
	$50^+$	0.124	scin
	$30^+$	0.384	scin

M.S.Freedman, F.Wagner, Jr., D.W.Engelkemier,  
Phys. Rev. 88, 1155(1952).

U L x ray/ $\alpha = 3 \times 10^{-2}$  pc

Holsrael, Phys. Rev. 88, 682(1952).

$Pu^{240}$	$\alpha$	24%	5.118	Pu(pile n) ms; s
94 146		76%	5.162	

F.Asaro, I.Parlman, Phys. Rev. 88, 828(1952).

$\gamma$		0.050	$Pu^{239}$ (pile n); sl ce <sup>-</sup>
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M.S.Freedman, F.Wagner, Jr., D.W.Engelkemier,  
Phys. Rev. 88, 1155(1952).

$Pu^{241}$	$\beta^-$		0.0205	$Pu^{240}$ (pile n); sl
94 147	$\gamma$	$100^+$	0.100	(K x ray?) scin
		$20^+$	0.145	
	†Photons per $10^7 \beta^+$ s			

M.S.Freedman, F.Wagner, Jr., D.W.Engelkemier,  
Phys. Rev. 88, 1155(1952).

$Am^{241}$	$\gamma$	$25^+$	0.0264	$Pu^{240}$ (pile n, $\gamma\beta$ ); pc
95 146			0.041	sl ce <sup>-</sup>
		$100^+$	0.059	sl ce <sup>-</sup> , pc

M.S.Freedman, F.Wagner, Jr., D.W.Engelkemier,  
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$\gamma$		0.0603	d $10^9 Pu$ ; pc
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## NEUTRON CROSS SECTIONS

Reaction	$\sigma$ Type	Value	Energy	Ref.
H(n)	$\sigma_t$ as f(T) for H <sub>2</sub>		$\sim 0.034$ ev	52g2
	$\sigma_t$	3.38	1.32	53s1
	$\sigma_t$	0.686	14.1	52c1
	$\sigma_t$	0.074 - 0.0413	97 - 220	52m1
	$\sigma_t$	0.037	390	53h1
He(n)	$\sigma_t$	1.02	14.1	52c1
	$\sigma_t$	0.200	84	53h2
$Li^6(n, t)He^4$		25 mb	14	53f1
$Li^6(n, d)He^5$		$\sim 140$ mb*	14.2	52r1
$Li^6(n, d)He^5$ g.s.		80 mb	14	53f1
$Li^6(n, d)He^5$ excited		81 mb	14	53f1
$Li^6(n, p)He^6$		6 mb	14	53f1
$Li^6(n, p)$	$\sigma(0.83 He)$	6.7 mb	14	52b1

\* Erroneously reported as  $\sim 14$  mb, NSA 6, #20(1952).

## Neutron Cross Sections - continued

Reaction	$\sigma$ Type	Value	Energy	Ref.
$Li^6(n)$	$\sigma_t$	1.39	14.1	52c1
$Li^7(n, t)He^5$		53 mb	14	53f1
$Li^7(n, d)$	$\sigma(0.83 He)$	9.8 mb	14	52b1
$Li^7(n)$	$\sigma_t$	1.45	14.1	52c1
$Be^9(n, \alpha)$	$\sigma(0.83 He)$	10 mb	14	52b1
$Be^9(n)$	$\sigma_t$	1.53	14.1	52c1
$B(n, < 11.5n)$	$\sigma_{in}$	0.69	14	52p2
82% $B^{10}$				
(n, < 2.6n)		0.24		
$B^{10}(n)$	$\sigma_t$	1.47	14.1	52c1
$B^{11}(n)$	$\sigma_t$	1.40	14.1	52c1
$C(n, < 11.5n)$	$\sigma_{in}$	0.76	14	52p2
(n, < 2.6n)		0.28		
$C^{12}(n, 2n)$	$\sigma(20^m C)$	graph	24 - 27	52b1
$C(n)$	$\sigma_t$	2.21	1.32	53s1
	$\sigma_t$	1.32	14.1	52c1
	$\sigma_t$	0.502 - 0.297	97 - 220	52m1
	$\sigma_t$	0.287	390	53h1
$N(n, < 11.5n)$	$\sigma_{in}$	0.79	14	52p2
(n, < 2.6n)		0.46		
$N(n)$	$\sigma_t$	1.59	14.1	52c1
$O(n)$	$\sigma_t$	1.58	14.1	52c1
$F(n)$	$\sigma_t$	1.70	14.1	52c1
$Na(n)$	$\sigma_t$	1.71	14.1	52c1
	$\sigma_t$	graph	0.12 - 1	52s1
$Mg(n)$	$\sigma_t$	1.75	14.1	52c1
$Al(n, < 11.5n)$	$\sigma_{in}$	1.06	14	52p2
(n, < 2.6n)		0.52		
$Al(n)$	$\sigma_t$	1.38	5ev - 5kev	52m4
	$\sigma_t$	1.73	14.1	52c1
$Al^{27}(n, \alpha)$	$\sigma(16.0^h Na)$	0.135	14.1	52f1
$Al^{27}(n, p)$	$\sigma(9.6^m Mg)$	0.079	14.1	52f1
$Si(n)$	$\sigma_t$	1.86	14.1	52c1
$P(n)$	$\sigma_t$	1.97	14.1	52c1
$P^{31}(n, p)$	$\sigma(2.6^h Si)$	0.091	14.1	52f1
$S(n)$	$\sigma_t$	2.06	13.3	52a1
	$\sigma_t$	1.92	14.1	52c1
$S^{33}(n, p)$	$\sigma(26^d P)$	2.3 mb	th	52w1
$Cl(n)$	$\sigma_t$	2.00	14.1	52c1



## Neutron Cross Sections - continued

Reaction	$\sigma$ Type	Value	Energy	Ref.
K(n)	$\sigma_t$	2.24	14.1	52c1
K <sup>39</sup> (n)	$\sigma_a$	1.9	th	52p1
K <sup>40</sup> (n)	$\sigma_a$	~ 65	th	52p1
K <sup>41</sup> (n)	$\sigma_a$	1.2	th	52p1
Ca(n)	$\sigma_t$	2.19	14.1	52c1
Ti(n)	$\sigma_t$	2.28	14.1	52c1
Cr(n)	$\sigma_t$	2.45	14.1	52c1
Mn(n, $\gamma$ )	$\sigma(2.6^h\text{Mn})$	12.0	th	52b2
Mn(n)	$\sigma_t$	2.54	14.1	52c1
Fe(n, < 11.5n)	$\sigma_{in}$	1.45	14	52p2
(n, < 2.6n)		1.21		
(n, < 1.4n)		0.78		
Fe(n)	$\sigma_t$	2.60	14.1	52c1
	$\sigma_t$	graph	1-3.2	52m2
Fe <sup>56</sup> (n,p)	$\sigma(2.6^h\text{Mn})$	0.124	14.1	52f1
Co(n)	$\sigma_t$	graph	1ev-5kev	52m4
	$\sigma_t$	2.72	14.1	52c1
Co <sup>59</sup> (n, $\gamma$ )	$\sigma(10^m\text{Co})$	19	th	52m3
Ni(n)	$\sigma_t$	graph	5ev-5kev	52m4
Ni(n)	$\sigma_t$	2.67	14.1	52c1
	$\sigma_t$	graph	1-3.2	52m2
Ni <sup>58</sup> (n)	$\sigma_a$	4.2	th	52p1
Ni <sup>60</sup> (n)	$\sigma_a$	2.5	th	52p1
Ni <sup>61</sup> (n)	$\sigma_a$	2	th	52p1
Ni <sup>62</sup> (n)	$\sigma_a$	15	th	52p1
Cu(n, < 11.5n)	$\sigma_{in}$	1.51	14	52p2
(n, < 2.6n)		1.32		
(n, < 1.4n)		0.87		
Cu(n)	$\sigma_t$	graph	1-3.2	52m2
	$\sigma_t$	3.1	13.3	52a1
	$\sigma_t$	2.5	14	52g1
	$\sigma_t$	2.96	14.1	52c1
Cu <sup>63</sup> (n,2n)	$\sigma(10^m\text{Cu})$	0.510	14.1	52f1
Cu <sup>63</sup> (n,2n)	$\sigma(10^m\text{Cu})$	graph	12-27	52b2
Cu <sup>65</sup> (n,2n)	$\sigma(12.6^h\text{Cu})$	0.970	14.1	52f1
Cu <sup>65</sup> (n,p)	$\sigma(2.56^h\text{Ni})$	0.019	14.1	52f1
Zn(n)	$\sigma_t$	3.06	14.1	52c1
	$\sigma_t$	graph	1-3.2	52m2
Ga(n)	$\sigma_t$	graph	5ev-5kev	52m4
	$\sigma_t$	3.19	14.1	52c1
Ga <sup>69</sup> (n)	$\sigma_a$	2.0	th	52p1
Ga <sup>71</sup> (n)	$\sigma_a$	4.9	th	52p1

## Neutron Cross Sections - continued

Reaction	$\sigma$ Type	Value	Energy	Ref.
Se(n)	$\sigma_t$	3.56	14.1	52c1
Se <sup>74</sup> (n)	$\sigma_a$	50	th	52p1
Se <sup>76</sup> (n)	$\sigma_a$	82	th	52p1
Se <sup>77</sup> (n)	$\sigma_a$	40	th	52p1
Se <sup>78</sup> (n)	$\sigma_a$	0.4	th	52p1
Se <sup>80</sup> (n)	$\sigma_a$	0.59	th	52p1
Se <sup>82</sup> (n)	$\sigma_a$	2	th	52p1
Br(n)	$\sigma_t$	3.52	14.1	52c1
Kr <sup>78</sup> (n)	$\sigma(34^h\text{Kr})$	1.6	th	52b5
Sr(n)	$\sigma_t$	graph	0.05-3.2	52m2
	$\sigma_t$	3.68	14.1	52c1
Sr <sup>84</sup> (n, $\gamma$ )	$\sigma(85^d\text{Sr})$	0.32	th	52h2
Y(n)	$\sigma_t$	graph	0.05-3.2	52m2
	$\sigma_t$	3.88	14.1	52c1
Zr(n)	$\sigma_t$	graph	1-3.2	52m2
	$\sigma_t$	3.6	14	52g1
	$\sigma_t$	4.00	14.1	52c1
Nb(n)	$\sigma_t$	graph	0.12-3.2	52m2
	$\sigma_t$	4.02	14.1	52c1
Mo(n)	$\sigma_t$	graph	1ev-10kev	52b5
	$\sigma_t$	graph	0.02-3.2	52m2
	$\sigma_t$	4.04	14.1	52c1
Mo <sup>92</sup> (n)	$\sigma_a$	< 0.3	th	52p1
Mo <sup>92</sup> (n,2n)	$\sigma(15.5^m\text{Mo})$	graph	13.2-27	52b2
Ag(n)	$\sigma_t$	graph	12ev-5kev	52m4
	$\sigma_t$	graph	1-3.2	52m2
	$\sigma_t$	4.34	14.1	52c1
Ag <sup>107</sup> (n,2n)	$\sigma(24.5^m\text{Ag})$	0.56	14.1	52f1
Ag <sup>109</sup> (n,2n)	$\sigma(2.3^m\text{Ag})$	1.0	14.1	52f1
Cd(n, < 11.5n)	$\sigma_{in}$	1.89	14	52p2
(n, < 2.6n)		1.66		
(n, < 1.4n)		1.14		
Cd(n)	$\sigma_t$	7900	0.18 ev	52b3
	$\sigma_t$	4.44	14.1	52c1
In(n)	$\sigma_t$	graph	1-3.2	52m2
	$\sigma_t$	4.53	14.1	52c1
Sn(n)	$\sigma_t$	graph	1-3.2	52m2
	$\sigma_t$	4.68	14.1	52c1
Sb(n)	$\sigma_t$	graph	1-3.2	52m2
	$\sigma_t$	4.71	14.1	52c1
Sb <sup>121</sup> (n)	$\sigma_a$	5.7	th	52p1

## Neutron Cross Sections - continued

Reaction	$\sigma$ Type	Value	Energy	Ref.
Te (n)	$\sigma_t$	4.9	14.1	52c1
I (n)	$\sigma_t$	graph	5ev - 5kev	52m4
	$\sigma_t$	graph	1 - 3.2	52m2
	$\sigma_t$	4.7	14.1	52c1
Ba (n)	$\sigma_t$	graph	0.05 - 3.2	52m2
	$\sigma_t$	5.2	14.1	52c1
La (n)	$\sigma_t$	graph	0.02 - 3.2	52m2
	$\sigma_t$	5.2	14.1	52c1
Ce (n)	$\sigma_t$	graph	0.02 - 3.2	52m2
	$\sigma_t$	5.1	14.1	52c1
Pr (n)	$\sigma_t$	graph	0.05 - 3.2	52m2
	$\sigma_t$	4.9	14.1	52c1
Nd <sup>142</sup> (n)	$\sigma_a$	18	th	52p1
Nd <sup>143</sup> (n)	$\sigma_a$	290	th	52p1
Nd <sup>144</sup> (n)	$\sigma_a$	4.8	th	52p1
Nd <sup>145</sup> (n)	$\sigma_a$	52	th	52p1
Nd <sup>146</sup> (n)	$\sigma_a$	9.8	th	52p1
Nd <sup>148</sup> (n)	$\sigma_a$	~3.3	th	52p1
Nd <sup>150</sup> (n)	$\sigma_a$	~3	th	52p1
Hf <sup>174</sup> (n)	$\sigma_a$	~500	th	52p1
Hf <sup>176</sup> (n)	$\sigma_a$	~15	th	52p1
Hf <sup>177</sup> (n)	$\sigma_a$	380	th	52p1
Hf <sup>178</sup> (n)	$\sigma_a$	70	th	52p1
Hf <sup>179</sup> (n)	$\sigma_a$	~50	th	52p1
Hf <sup>180</sup> (n)	$\sigma_a$	~13	th	52p1
Ta (n)	$\sigma_t$	graph	1 - 3.2	52m2
	$\sigma_t$	5.2	14.1	52c1
W (n)	$\sigma_t$	graph	1 - 3.2	52m2
	$\sigma_t$	5.3	14.1	52c1
Pt (n)	$\sigma_t$	5.4	14.1	52c1
Au (n, <11.5n)	$\sigma_{in}$	2.51	14	52p2
(n, <2.6n)		2.06		
(n, <1.4)		1.47		
Au (n)	$\sigma_t$	5.3	14.1	52c1
Hg (n)	$\sigma_t$	graph	3ev - 10kev	52h5
	$\sigma_t$	5.4	14.1	52c1
Tl (n)	$\sigma_t$	5.4	14.1	52c1

## Neutron Cross Sections - continued

Reaction	$\sigma$ Type	Value	Energy	Ref.
Pb (n, <11.5n)	$\sigma_{in}$	2.56	14	52p2
(n, <2.6n)		2.29		
(n, <1.4n)		0.91		
Pb (n)	$\sigma_t$	graph	1 - 3.2	52m2
	$\sigma_t$	5.4	14.1	52c1
Pb <sup>204</sup> (n)	$\sigma_a$	~0.9	th	52p1
Pb <sup>206</sup> (n)	$\sigma_a$	~0.1	th	52p1
	$\sigma_t$	graph	1 - 3.2	52m2
Pb <sup>207</sup> (n)	$\sigma_a$	0.70	th	52p1
Pb <sup>208</sup> (n)	$\sigma_a$	≤ 0.3	th	52p1
Bi (n, <11.5n)	$\sigma_{in}$	2.56	14	52p2
(n, <2.6n)		2.28		
(n, <1.4n)		1.03		
Bi (n)	$\sigma_t$	graph	1 - 3.2	52m2
	$\sigma_t$	5.5	14.1	52c1
Ra <sup>226</sup> (n, $\gamma$ )	$\sigma(42^{m}\text{Ra}^{227})$	22	th ?	52b4
Th (n)	$\sigma_t$	graph	2ev - 2kev	52h5
	$\sigma_t$	6.11	13.9	5011
U (n)	$\sigma_a$ coh	9.0	th	51s1
	$\sigma_t$	9.0	th	51s1
	$\sigma_t$	5.9	14.1	52c1
	$\sigma_t$	5.7	14.1	52c1
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## GROUND STATE Q'S

Reaction	Standard	Value	Method	Ref.
$\text{Be}^9(\text{p}, \alpha)\text{Li}^6$	$\text{Li}^7(\text{p}, \text{n})$	$+ 2.126 \pm 0.004$	EA	52c3
$\text{B}^{10}(\text{p}, \alpha)\text{Be}^7$	$\text{Li}^7(\text{p}, \text{n})$	$+ 1.147 \pm 0.0025$	EA	52c3
$\text{B}^{10}(\text{p}, \text{He}^3)\text{Be}^8$	$\text{Li}^7(\text{p}, \text{n})$	$- 0.536 \pm 0.003$	EA	52c3
$\text{N}^{14}(\text{d}, \text{p})\text{N}^{15}$	$\text{Po}^{212} \alpha$	$+ 8.613 \pm 0.011$	s	52m5
$\text{O}^{16}(\text{d}, \alpha)\text{N}^{14}$	$\text{Li}^7(\text{p}, \text{n})$	$+ 3.113 \pm 0.0035$	EA	52c3
$\text{O}^{18}(\text{p}, \alpha)\text{N}^{15}$	$\text{Be}^9(\text{d}, \alpha)$	$+ 3.96 \pm 0.04$	s	51s2
$\text{F}^{19}(\alpha, \text{p})\text{Ne}^{22}$		$+ 1.57$	ddl	52h6
$\text{Ne}^{21}(\text{p}, \text{n})\text{Na}^{21}$	$\text{F}^{19}(\text{p}, \text{n})$	$- 3.765$		52k1
$\text{Ne}^{21}(\text{d}, \alpha)\text{F}^{19}$	$\text{Bi}^{212} \alpha$	$+ 6.432 \pm 0.010$	s	52m5
$\text{Ne}^{21}(\text{d}, \text{p})\text{Ne}^{22}$	$\text{Po}^{212} \alpha$	$+ 8.137 \pm 0.011$	s	52m5
$\text{Ne}^{22}(\text{p}, \text{n})\text{Na}^{22}$	$\text{F}^{19}(\text{p}, \text{n})$	$- 3.913$		52k1
$\text{Na}^{23}(\text{d}, \text{p})\text{Na}^{24}$	$\text{Bi}^{212} \alpha$	$+ 4.723 \pm 0.008$	s	52m5
$\text{Na}^{23}(\text{d}, \text{p})\text{Na}^{24}$	$\text{Po} \alpha$	$+ 4.731 \pm 0.007$	ddl	52s2
$\text{Na}^{23}(\alpha, \text{p})\text{Mg}^{26}$		$+ 1.55$	ddl	52h6
$\text{Mg}^{24}(\alpha, \text{p})\text{Al}^{27}$		$- 1.613 \pm 0.010$	s	52k2
$\text{Al}^{27}(\alpha, \text{p})\text{Si}^{30}$		$+ 2.26 \pm 0.05$	ddl	51r1
$\text{Cl}^{35}(\text{d}, \text{p})\text{Cl}^{36}$		$+ 6.3$		52K3
$\text{Ti}^{46}(\text{d}, \text{p})\text{Ti}^{47}$	$\text{O}^{16}(\text{d}, \text{p})$	$+ 6.45 \pm 0.05$	range	52p4
$\text{Ti}^{47}(\text{d}, \text{p})\text{Ti}^{48}$	$\text{O}^{16}(\text{d}, \text{p})$	$+ 8.14 \pm 0.05 ?$	range	52p4
$\text{Ti}^{48}(\text{d}, \text{p})\text{Ti}^{49}$	$\text{O}^{16}(\text{d}, \text{p})$	$+ 5.81 \pm 0.04$	range	52p4
$\text{Ti}^{49}(\text{d}, \text{p})\text{Ti}^{50}$	$\text{O}^{16}(\text{d}, \text{p})$	$+ 8.62 \pm 0.05$	range	52p4
$\text{Ti}^{50}(\text{d}, \text{p})\text{Ti}^{51}$	$\text{O}^{16}(\text{d}, \text{p})$	$+ 4.11 \pm 0.07$	range	52p4
$\text{V}^{51}(\text{d}, \text{p})\text{V}^{52}$		$+ 6.25$	a, pc	51h1

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## PACKING FRACTION DIFFERENCES

$\Delta f$ , in Units  $10^{-4}$  amu

Doublet	$\Delta f$	Ref.
$\text{Ni}^{61} - \text{Te}^{122}$	$-3.43 \pm 0.05$	52h4
$\text{Ni}^{62} - \text{Te}^{124}$	$-3.71 \pm 0.03$	52h4
$\text{Ni}^{64} - \text{Te}^{128}$	$-3.81 \pm 0.05$	52h4
$\text{Cu}^{65} - \text{Te}^{130}$	$-3.95 \pm 0.03$	52h4
$\text{A}^{40} - \text{C}_2\text{O}$	$-8.186 \pm 0.005$	52j1
$\text{K}^{40} - \text{C}_2\text{O}$	$-7.78 \pm 0.02$	52j1
$\text{Ca}^{40} - \text{C}_2\text{O}$	$-8.139 \pm 0.002$	52j1
$\text{Pd}^{102} - \text{C}_4\text{H}_3$	$-13.933 \pm 0.008$	52h3
$\text{Pd}^{104} - \text{C}_4\text{H}_4$	$-15.32 \pm 0.01$	52h3
$\text{Pd}^{105} - \text{C}_8\text{H}_9$	$-15.78 \pm 0.01$	52h3
$\text{Pd}^{106} - \text{C}_4\text{H}_5$	$-16.57 \pm 0.02$	52h3
$\text{Pd}^{106} - \text{C}_8\text{H}_{10}$	$-16.52 \pm 0.02$	52h3
$\text{Pd}^{108} - \text{C}_4\text{H}_6$	$-17.64 \pm 0.01$	52h3
$\text{Pd}^{110} - \text{C}_4\text{H}_7$	$-18.65 \pm 0.01$	52h3
$\text{Cd}^{106} - \text{C}_4\text{H}_5$	$-16.26 \pm 0.01$	52h3
$\text{Cd}^{108} - \text{C}_4\text{H}_6$	$-17.58 \pm 0.01$	52h3
$\text{Cd}^{110} - \text{C}_4\text{H}_7$	$-18.74 \pm 0.01$	52h3
$\text{Cd}^{111} - \text{C}_8\text{H}_{15}$	$-19.203 \pm 0.007$	52h3
$\text{Cd}^{112} - \text{C}_4\text{H}_8$	$-19.818 \pm 0.009$	52h3
$\text{Cd}^{112} - \text{C}_8\text{H}_{16}$	$-19.860 \pm 0.008$	52h3
$\text{Cd}^{113} - \text{C}_8\text{H}_{17}$	$-20.231 \pm 0.008$	52h3
$\text{Cd}^{114} - \text{C}_4\text{H}_9$	$-20.82 \pm 0.01$	52h3
$\text{Cd}^{114} - \text{C}_3\text{H}_5\text{O}$	$-14.44 \pm 0.01$	52h3
$\text{Cd}^{116} - \text{C}_3\text{H}_6\text{O}$	$-15.41 \pm 0.01$	52h3



Packing Fraction Differences,  $\Delta f$ , in Units  $10^{-4}$  amu

(continued)

Doublet	$\Delta f$	Ref.
$\text{In}^{113} - \text{C}_8\text{H}_{17}$	$-20.245 \pm 0.009$	52h3
$\text{In}^{115} - \text{C}_9\text{H}_7$	$-13.148 \pm 0.009$	52h3
$\text{Sn}^{115} - \text{C}_9\text{H}_7$	$-13.17 \pm 0.02$	52h3
$\text{Sn}^{116} - \text{C}_3\text{H}_6\text{O}$	$-15.65 \pm 0.02$	52h3
$\text{Sn}^{116} - \text{C}_9\text{H}_8$	$-13.83 \pm 0.01$	52h3
$\text{Sn}^{117} - \text{C}_9\text{H}_9$	$-14.299 \pm 0.008$	52h3
$\text{Sn}^{118} - \text{C}_3\text{H}_7\text{O}$	$-16.72 \pm 0.02$	52h3
$\text{Sn}^{118} - \text{C}_9\text{H}_{10}$	$-14.94 \pm 0.02$	52h3
$\text{Sn}^{119} - \text{C}_9\text{H}_{11}$	$-15.376 \pm 0.009$	52h3
$\text{Sn}^{120} - \text{C}_5$	$-8.15 \pm 0.01$	52h3
$\text{Sn}^{122} - \text{C}_5\text{H}$	$-9.20 \pm 0.01$	52h3
$\text{Sn}^{124} - \text{C}_5\text{H}_2$	$-10.169 \pm 0.008$	52h3
$\text{Te}^{120} - \text{C}_9\text{H}_{12}$	$-15.79 \pm 0.01$	52h3
$\text{Te}^{122} - \text{C}_5\text{H}$	$-9.244 \pm 0.007$	52h3
$\text{Te}^{122} - \text{N}^{16}\text{I}$	$+3.43 \pm 0.05$	52h4
$\text{Te}^{123} - \text{C}_5\text{H}$	$+9.06 \pm 0.03$	52h3
$\text{Te}^{124} - \text{C}_5\text{H}_2$	$-10.340 \pm 0.008$	52h3
$\text{Te}^{124} - \text{N}^{16}\text{I}$	$+3.71 \pm 0.03$	52h4
$\text{Te}^{125} - \text{C}_5\text{H}_2$	$+10.16 \pm 0.03$	52h3
$\text{Te}^{126} - \text{C}_5\text{H}_3$	$-11.359 \pm 0.005$	52h3
$\text{Te}^{128} - \text{C}_{10}\text{H}_8$	$-12.273 \pm 0.009$	52h3
$\text{Te}^{128} - \text{N}^{16}\text{I}$	$+3.81 \pm 0.05$	52h4
$\text{Te}^{130} - \text{Cu}^{65}$	$+3.95 \pm 0.03$	52h4
$\text{Te}^{130} - \text{C}_5\text{H}_5$	$-13.180 \pm 0.008$	52h3
$\text{I}^{127} - \text{C}_{10}\text{H}_7$	$-11.82 \pm 0.01$	52h3
$\text{Xe}^{124} - \text{C}_5\text{H}_2$	$-10.098 \pm 0.005$	52h3
$\text{Xe}^{126} - \text{C}_5\text{H}_3$	$-11.31 \pm 0.01$	52h3
$\text{Xe}^{128} - \text{C}_{10}\text{H}_8$	$-12.432 \pm 0.006$	52h3
$\text{Xe}^{129} - \text{C}_3\text{H}_7$	$-20.12 \pm 0.01$	52h3
$\text{Xe}^{130} - \text{C}_5\text{H}_5$	$-13.451 \pm 0.006$	52h3
$\text{Xe}^{131} - \text{CO}_2$	$-4.94 \pm 0.03$	52h3
$\text{Xe}^{132} - \text{C}_5\text{H}_6$	$-14.394 \pm 0.009$	52h3
$\text{Xe}^{132} - \text{CO}_2$	$-4.95 \pm 0.01$	52h3

Packing Fraction Differences,  $\Delta f$ , in Units  $10^{-4}$  amu

(continued)

Doublet	$\Delta f$	Ref.
$\text{Xe}^{134} - \text{C}_5\text{H}_7$	$-15.257 \pm 0.007$	52h3
$\text{Xe}^{136} - \text{C}_5\text{H}_8$	$-16.051 \pm 0.006$	52h3

52h3 R.E.Halsted, Phys. Rev. 88, 666(1952).

52h4 B.G.Hogg, H.E.Duckworth, Can. J. Phys. 30, 628(1952).

52j1 W.H.Johnson, Jr., Phys. Rev. 88, 1213(1952).

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